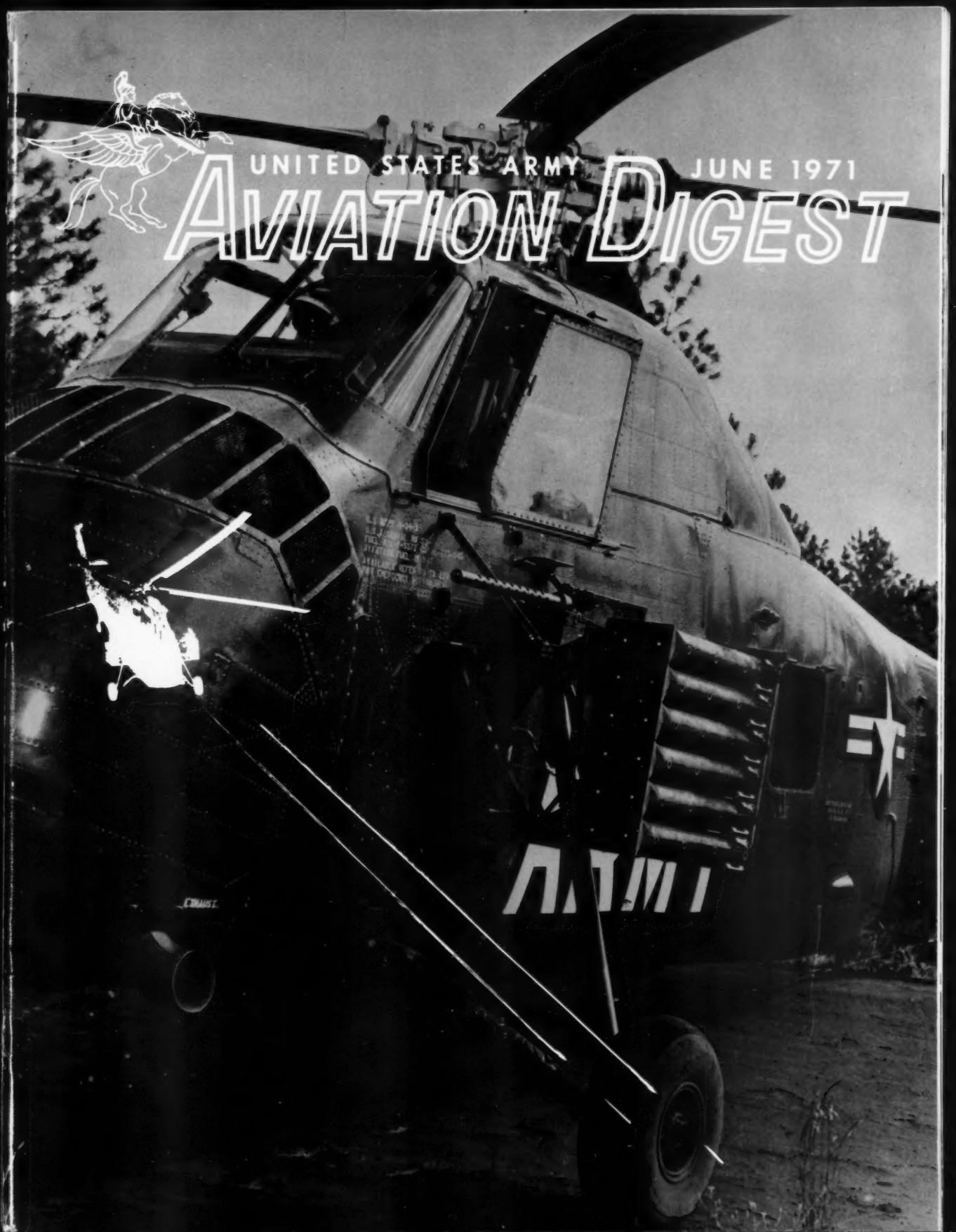
UNITED STATES ARMY
JUNE 1971
AVIATION DIGEST

UNITED STATES ARMY AVIATION DIGEST

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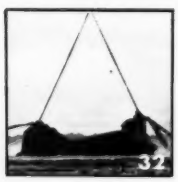

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ABOUT THE COVER

This month as Army aviation celebrates its 29th birthday, we salute the pioneers in helicopter armament and tactics. Cover photo is one of the first CH-34s to be experimentally armed at the aviation school at Ft. Rucker, Ala., in the late 1950s. Armament includes twin .50 caliber machine guns and 4.5-inch rockets

The mission of the U. S. ARMY AVIATION DIGEST is to provide information of an operational or functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine, and other related data.

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Articles, photos, and items of interest on Army aviation are invited. Direct communication is authorized to: Editor, U. S. Army Aviation Digest, Fort Rucker, Ala. 36360.

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VIEWS FROM READERS

Sir:

I wish to thank you for publishing the letter which appeared on page 19 of the April 1971 edition of AVIATION DIGEST.

There are many of us "junior" warrant officers (we were all junior as far as George T. was concerned) who remember and were associated with "Super Chief." There were many who swore at him and many a "34" driver who owes his life to lessons learned from George. As a retired nonrated maintenance type, I would like to add my thanks to Colonel Millett for his fine letter telling us about a crusty Super Chief that Army aviation owes so much to.

CW3 Leo Rodden (Ret.)
830 Carneal Road
Lexington, Ky. 40505

Sir:

CW2 Hesket's article on refueling the CH-47 [AVIATION DIGEST, March 1971, page 32] makes a lot of sense, although most of his procedures are SOP in all units of the First Aviation Brigade in Vietnam. The units I have been in (the 243d ASHC "Freight Trains" and the 178th ASHC "Box Cars") learned through experience that the safest method of operating this aircraft is to shut down at least every other refueling stop for a quick maintenance check. It accomplishes several things:

1. You don't fall out of the sky because some problem has developed in flight. In most cases the check catches problems while they are still minor and allows on-the-spot tightening, adjustment and minor repairs. It also finds such items as hangar bearing failures which, if not repaired promptly, will cause more severe damage to the aircraft if loads are being carried externally.

2. It actually increases rather than decreases the productive time of the aircraft, especially when long distances from home stations are involved.

3. It increases crew responsibilities and, at the same time, increases crew confidence in the aircraft, a valuable asset in training new crew members. With a little assistance from the pilot and copilot, this check can be accomplished in a very short time. We felt that with the age of the CH-47As this was the most important routine to follow, even though it occasionally increased our work day by a short amount of time.

MAJ Donald W. Reck
U. S. Army Aviation School Element
Hunter AAF, Ga. 31409

Sir:

While flying in RVN and now in Europe the following question has arisen and no one has been able to find an answer; consequently, I thought that perhaps it could be answered by one of your research specialists. At any rate here it is: While flying in air space designated as a flight level (either IACO or U. S. jurisdiction) does one introduce the "K" factor to the standard altimeter setting of 29.92?

I have been told both ways; however, no one is able to provide a reference. I personally never use the K factor due to the fact that none of our sister services uses it while flying at an altitude designated as a flight level.

CPT Stan W. King
2d M. I. Flight Section
Sembach Air Base
APO New York 09103

• Your letter was forwarded to the U. S. Aeronautical Services Office, Cameron Station, Alexandria, Va., which provided the following answer to your question:

We recommend the use of the "K" factor adjustment whenever the error does not exceed the 70 feet maximum permitted (.07 inches Hg). If the error exceeds this factor you should consider the instrument unreliable. Basis reference for this function is found in TM 1-225, paragraph 2-37.

The following logic may help in understanding this practice. Suppose you take off from a sea level airfield for which the current altimeter setting is 29.92 (Hg) and the altimeter reads minus 60 feet. You would set the altimeter to read 00 feet and note the Hg difference (K factor) in the Kollsman window. When cruising where 29.92 is normally used as a standard, you would accordingly maintain the same correction (K) factor. This correction would also be applied to any subsequent current altimeter setting required and will compensate for the inherent 60-foot error. DOD FLIP describes altimeter setting procedures but does not address the error adjustment. It's good to remember that you've set the 29.92 only after you've adjusted for the known error.

We trust this will help clear the issue for you. Your letter has identified a need to clarify the procedures contained in reference manuals. With thanks to you, we have brought this to the attention of responsible offices.

Sir:

Due to the fact that I am a supply officer for Company E, 42d Aviation Battalion, New York Army National Guard, and trying to keep our pilots supplied with the latest safety equipment, I am interested in the disposition of Nomex suits in CONUS.

Through our normal supply procedures here and at higher levels we have been unable to obtain Nomex flight suits, gloves, SPH-4 helmets, etc. We do have the same problems with flying safety as the active Army.

However, there is a surplus store in New York City which is presently selling the Nomex flying uniform for $14.00 per set. Some of this equipment is new and some used. If they can get this equipment so fast and we cannot, how come?

CW2 William L. Seymour
New York Army National Guard
Amityville, N. Y. 11701

Sir:

I am writing in regard to a letter which appears in the "Views From Readers" column of the March 1971 issue of AVIATION DIGEST.

Continued on page 35

We Armed The Helicopter

The helicopter was the "ugly duckling" of aviation in the mid 1950s. But there were a few who dared to think of it as a weapons system and the key to successful airmobile operations. Today there are few who would think of going into combat without the helicopter

Colonel Jay D. Vanderpool
U. S. Army, Retired

HELICOPTER armament was inevitable. The requirement was generated by the historic National Security Act of 1947 which established the U. S. Army and U. S. Air Force as separate departments. The Air Force retained the responsibility for close air support; the Army was allowed to retain light observation aircraft with Army pilots.

The next decade saw a national military doctrine dictated by strategic nuclear weapons. The strategic air command held first priority on the Air Force budget. The tactical air command directed its limited funds primarily to intercept and interdiction functions, with little left for close support. As jet aircraft flew higher and faster they became less responsive to the ground commander.

Meanwhile, the helicopter was battle-tested during the Korean War. It was then that I first became acquainted with this amazing flying machine. My organization was a cloak and dagger outfit engaged in military operations behind enemy lines in North Korea. It was a joint and combined command. As a contribution from our theater Air Force commander we were assigned a squadron of Sikorsky UH-19s, primarily I think because no one knew what else to do with them.

The value of the helicopter was soon recognized in the roles of air-sea rescue and aeromedical evacuation. Not many people had the time or inclination to study this new vehicle but the nature of my job forced me to learn how to use it.

One mission profile demonstrates what the helicopter could replace in that war. Normally, when I visited one of our offshore island bases behind enemy lines I would go by jeep to a port or beach. There I'd take a Navy landing boat out to deep water where I'd board a British light cruiser escorted by destroyers. We'd steam at 25 knots to the island where we offloaded in a landing craft. Another jeep would take me to the base. That tied up a lot of hardware and time to move one officer around the battlefield.

Left: Colonel Jay D. Vanderpool directed and sparked the development of the Army's airmobility and armed helicopter programs in the 1950s. He was not an aviator but his World War II and Korean War experiences made him uniquely aware of the helicopter's potential on the battlefield

ANNUAL
AWARD
CONTEST

Right: Brigadier General Carl I. Hutton triggered development of the armed helicopter when he was the commandant of the U. S. Army Aviation School at Ft. Rucker, Ala., in the mid 1950s

When we received the helicopters we would fly from our headquarters in Seoul direct to the island base, refuel and return. One helicopter, two pilots and a crew chief relieved a large combat force for other missions. However, one thing disturbed us: we were unarmed. When we did not have a fighter escort, we flew well out to sea over the ice flow where survival in the Yellow Sea in winter was estimated at less than 8 minutes.

In 1955 I was assigned to the U. S. Army Aviation School at Ft. Rucker, Ala., and took an interest in helicopter armament system experiments which were being conducted within the Army but unfortunately did not prove conclusive. Then in June 1956, Brigadier General Carl I. Hutton, commander at Ft. Rucker, was determined to prove the feasibility of arming helicopters and developing a 100 percent armed, airmobile force. I was given the mission and later, as Chief of the U. S. Army Aviation School's Combat Developments Office, guided the program through its early years.

Our basis or excuse for action was a training memorandum from General Willard Wyman in the Continental Army Command directing the development of highly mobile task forces with an improved ratio of firepower to manpower for employment on the nuclear battlefield. GEN Wyman did not tell us to use armed helicopters, but neither did he tell us not to. We went to work using our local resources. On 13 July 1956 GEN Wyman formally approved our experimentation, providing we coordinated with the U. S. Army Infantry School at Ft. Benning, Ga.

We deliberately started with a small cadre of five people and selected the OH-13 as our first test vehicle. We decided to start with caliber .50 machine guns and antitank aerial rockets. We picked the caliber .50, reasoning that if we could handle it smaller weapons would not pose serious problems. We chose the antitank rocket because we considered the tank to be the most difficult target on the battlefield to hit and kill.

The most promising antitank rocket available was the Swiss-made Oerlikon, 8 centimeter, fixed-fin weapon designed for delivery by fixed wing aircraft. The rocket was launched with a zero travel rail which was easy to install and had very little dead weight after firing. The weight penalty for four rockets, rail, gunsight and station distributor was 146 pounds. We wired the system for single rounds or a ripple at 100 milliseconds.

The machine gun installation cost us 150 pounds, plus the ammunition which was about 35 pounds per hundred. We were, of course, crowding our weight limitations. The machine gun recoil thrust was "softened" with edgewater adapters.

There were many unknowns the first day we went out to what is now Matteson Range:

- Would the machine gun recoil shock do structural damage to the airframe?
- Would the muzzle blast break the plastic bubble and doors?

• Would the machine gun recoil thrust cause a serious pitching attitude in flight?

• Would the recoil generate a serious decrease in air speed?

There were also some real questions concerning the aerial rocket system which was designed for launch speeds of 180 knots or more. Rail travel was only about an inch from the shear pin and we were to try a zero air speed launch with a zero travel guide rail:

• Would the rocket tumble?

• Would the helicopter rotor downwash on the big fixed fins deflect the trajectory?

The rapid ignition of the rocket motor, restrained by a 12G shear pin, gave hope that the shear pin would hold until we had enough thrust to give us a stable flight. We bore-sighted our systems in some 800 yards down range and were ready to test fire from an elevated wooden platform on which the helicopter was securely anchored (see back cover). We had not invited a large gallery—only GEN Hutton, the test team and a few others.

We tested the machine guns first singly and then in pairs with increasingly long bursts. We stopped frequently to inspect visually for structural damage but found none. In later tests the muzzle blast and/or vibration unlocked the doors which were riddled. We removed the doors as an unnecessary luxury.

We next test fired a rocket by remote signal. It impacted down range on line for azimuth and slightly short of the bore-sight point. We could hardly believe it, so we fired some more singly and in ripple. The dispersion pattern was much smaller than we had even hoped it would be. We were close to an antitank system.

The next step was to crank up the helicopter to cruise rpm, pull some pitch to generate a good downwash and fire more rockets. With our telescopes and binoculars we could not detect any appreciable increase in the dispersion pattern.

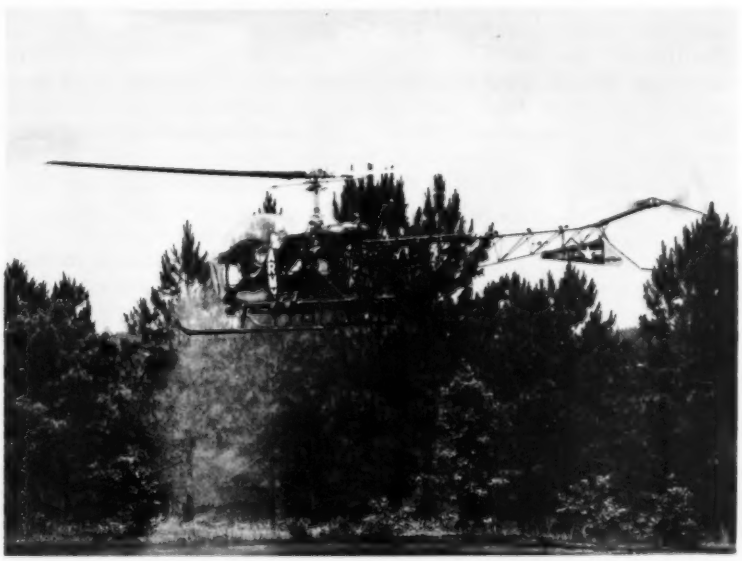
After a final check for structural damage we fired both guns and rockets from a low hover. We had no problems except that the dispersion was greater—whether due to the pilot or the system we were not then sure.

After another examination for structural damage the pilot took the ship around and fired machine guns and rockets down range from about 100 feet altitude. We reloaded and made several more firing passes. Accuracy was increased with each pass. We had had no problems . . . we were a mighty excited and happy group.

We knew we did not have the optimum air vehicle nor an optimum weapons system, but we had proven the feasibility and practicality of arming the helicopter. We were particularly elated over the surprising accuracy of our weapons. Most previous studies had concluded that the helicopter was too unstable to be employed as a weapons platform. The studies were wrong.

The next step was to study armed airmobile tactical organizations or formations—our real objective. GEN Hutton directed on a Friday afternoon that we develop a conceptual sky cavalry—an airmobile tactical force of company size; determine the aircraft requirements; determine troop and pilot requirements; sketch a troop maneuver scenario; assemble the pilots, troops and aircraft on the parade ground Sunday morning for briefings; and conduct a maneuver Sunday afternoon. We were pretty busy that weekend.

I drafted the organization that night. The doctrine was still in our minds. I leaned heavily on the Duke of Wellington's concepts of cavalry, dragoons and artillery employment. His caval-



Right: Machineguns are fired from an OH-13 during helicopter armament tests in the early 1950s at Ft. Rucker's Matteson Range

Left: OH-13 helicopters were available at Ft. Rucker in the '50s. Thus, they were used both for armament tests as depicted on page 5 and also as seen here for the development of airmobile tactical concepts

rymen fought from their mounts. The dragoons were horse-mounted infantry who dismounted to fight. They were supported by horsemobile artillery. His trains moved by horsedrawn wagon. Wellington had done well with this type organization; we would try it.

We employed the helicopters available in 1956 and our pilots were selected instructor pilots from the aviation school. The infantrymen were drawn from school troops. Helicopters were taken from the school training fleet. They were unarmed of course.

That Sunday GEN Hutton and I experimented with command and control of the airmobile force. My biggest problem was grasping how quickly the force could respond. It could converge on a point in moments or disperse over miles of area in minutes. *The cavalry platoon could cover dozens of square miles in a matter of minutes.*

Our early scenarios assumed that the enemy had a radar detection and antiaircraft capability. We stressed that the helicopter must take advantage of covered approaches and use its inherent speed and agility to achieve surprise. This required careful terrain analysis and treetop flying. We flew just above the trees or between them when we could. Although we were freed from terrain and vegetation, we wanted to use them for concealment. We wanted to be sneaky.

The professional instructor pilots, mostly civilians, were good—very good. The new tactical flying was a welcome change from their routine training missions. Each pilot tried to find better techniques for low altitude maneuvers. We were all learning together.

During 1956 and early 1957 we worked on experimental weapons systems during weekdays and experimented with tactics and techniques on weekends when the school was closed. We recognized requirements for weapons systems for specific missions as defined by Wellington. We needed weapons for hard targets and soft targets, for point targets and area targets.

The "cavalryman" would fight from his mount. He needed all the firepower his reconnaissance helicopter could lift and still accomplish the mission.

The "dragoons" would dismount to fight. The primary aircraft mission was to deliver troops. Some defensive or suppressive fire was desirable to ensure safe delivery and evacuation of the infantry.

Artillery or weapon ships would support the entire force, whether airborne or in ground maneuver. Maximum firepower within lift capabilities was essential.

Trains would require some protective or suppressive fire to permit mission accomplishment with minimum cavalry or artillery support.

With these principles in mind we extended our testing within our own resources of men and materiel. We didn't have any money but we did have ideas, helicopters, maintenance and fuel from the aviation center. We scrounged everything else from Air Force, Navy, Army ordnance and industry. It was all condoned and encouraged at lower levels of command and generally ignored at higher levels.

We knew we had to prove our concepts, obtain recognition, research and development (R&D) money, machines and manpower before we were shot down in flames. Dozens of systems were fabricated in our shop and tested.

Continued on page 24

FOG DISSIPATION QUESTIONNAIRE

Numerous experiments have been carried out with helicopters in attempts to dissipate warm fog. Many of these experiments have been successful, while others have failed. There are at present several documented cases of rotary wing aircraft being used to dissipate fog; however, it is believed that other experiences that might provide valuable information on the subject may have gone unreported or undocumented.

In order to expand the data base on the subject, it is requested that anyone with personal experiences or knowledge of the downwash of rotary wing aircraft being used to dissipate fog, please supply the information on the questionnaire. Information pertaining to the fog dissipation project at Ft. Rucker, Ala., during 1 to 28 February 1971 may be omitted.

Please cut out this page, fold and mail.

I. a. **NAME:** _____

b. **RANK:** _____

c. **SSAN:** _____

d. **UNIT, DUTY PHONE:** _____

II. a. **Location/Date/Time of Fog Dissipation Experience:** _____

_____

_____

b. **Type Terrain:** _____

_____

c. **Visibility on ground and on top of fog:** _____

_____

d. **Aircraft type/gross weight:** _____

_____

e. **Flight Posture (hover, slow forward flight, etc.) and any additional flight information you consider pertinent to the experience:** _____

_____

_____

III. **Summarize what was done and what resulted from that action:** _____

_____

_____

_____

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OH-58 Kiowa Power Margin

Dan Tisdale Jr.

Dan Tisdale Jr., a sales engineer with Bell Helicopter Co., explains the power capabilities of the Kiowa

IF YOU HAVE never flown a turbine-powered helicopter, the rules you have learned about using manifold pressure for power management will have to be "unlearned" when you start flying the OH-58A Kiowa. If you have flown other turbine-powered helicopters, you may still have to modify your technique for the characteristics of each helicopter are different. In either case you, the professional pilot, must understand how the Kiowa's performance is affected by the power margin—the excess power available over the power you demand. (The *power available* for use is limited by the engine and/or airframe rating and *power margin* does not imply an engine power reserve above this maximum rating.) Let's look then at this power margin, how you determine it and why you need to know it, and establish some guidelines for evaluating the Kiowa's capability.

Basis for Power Margin—Power Available

To understand how an aircraft performs under various operating conditions, it is necessary to comprehend the effects of these conditions on the engine rating and power output. The OH-58A Kiowa is powered by an Allison T63-A-700 turbine engine that produces 317 horsepower at sea level on a standard day. When the altitude and/or temperature differ, so does the power output (figure I).

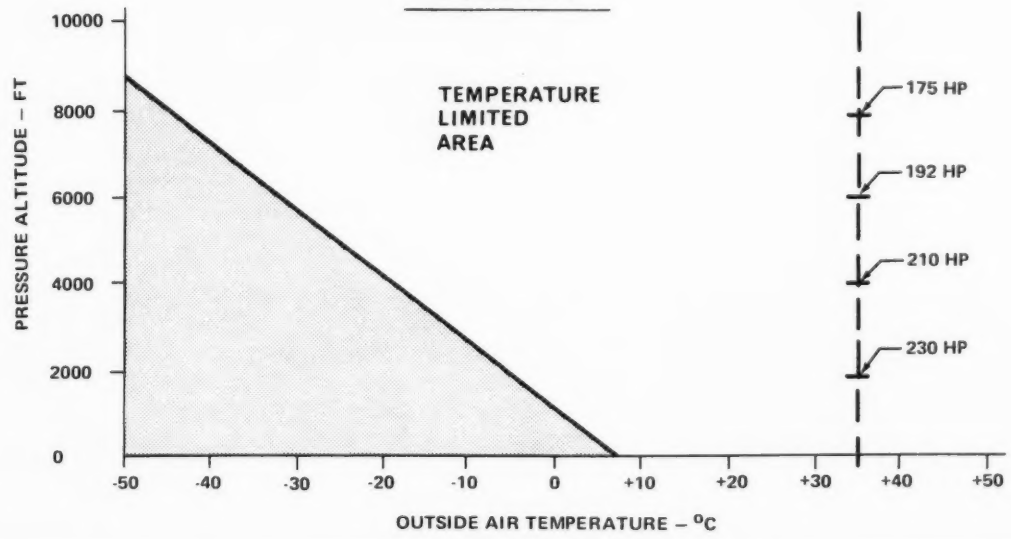
At *all* combinations of temperature and altitude within the shaded area in figure I, 317 horsepower are available. At greater altitudes and temperatures, however, the power available will be reduced. The line at +35 degrees C. shows how the power available is reduced as altitude is increased at that temperature. A temperature change alone has an even greater impact on power available. For example, a 10-degree increase in outside air temperature reduces the power output by approximately 10 percent. This is not so in a reciprocating engine. Less than 2 percent of power is lost with the 10-degree change in outside air temperature or an equivalent carb-air temperature adjustment. It is because of these variations in power with altitude and temperature that power available charts are so important to the aviator, and therefore, they are provided in the operator's manual. But there is another very important factor: time. If you take the power available for your conditions from the TAKE-OFF POWER chart, you can use it for 30 minutes without exceeding the engine limitations. Values taken from the NORMAL POWER chart have no time limit; they are maximum-continuous ratings.

Power Indicators

The torquemeter and the turbine-outlet-temperature (TOT) gauge are both power indicators but ambient temperature and altitude affect their use. When conditions are such that the power output is somewhat less than the sea level standard rating, TOT will reach the redline while torque is still within the operating range below the torque redline. In this case the TOT is the power limiter; therefore, TOT margin represents the power margin.

At sea level on a cooler day, when power is applied the torque limit is reached before TOT hits the redline. Now torque is the power limitee. The OH-58A is designed so that this torque limit occurs when the engine is producing full-rated power, 317 horsepower. In other words, the transmission is rated at 317 horsepower so that the total output of the engine can be utilized if necessary. In some helicopters the transmission is rated below the engine's maximum output, so there is a torque limit at some value less than the engine's peak power. But, the torquemeter in the OH-58A reaches the redline only when maximum power is being transmitted to the transmission and under these conditions the

FIGURE I



torque margin is indicative of power margin. It is evident that operating conditions have a substantial effect on the engine's power output and, consequently, on the limits that the pilot must abide by (figure II).

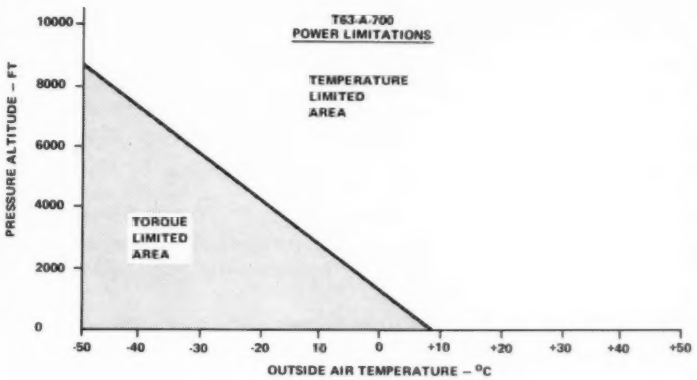
Figure II indicates when each of the two indicators (TORQUE or TOT) should be used. At all altitude and temperature combinations within the shaded area 317 horsepower are available and torque is the limiting factor. In effect, in this torque-limited area power margin is of little concern because performance capability is more than ample, even at maximum gross weight, but you must monitor torque to prevent exceeding the limits in accordance with the operator's manual.

TOT is the limiting factor outside the shaded area. Since less than 317 horsepower are available the helicopter cannot reach the torque limit. In effect, you reach redline TOT at the power available for those conditions. In the temperature-limited area, performance capability is not as well defined as when full power is available. For this reason power margin in terms of TOT can be a useful aid to predict performance capability.

The TOT gauge is shown below with the operating limits

MAX CONTINUOUS – 693°C
30-MIN LIMIT – 749°C

FIGURE II



Some rules of thumb for predicting performance capability for the OH-58A can be drawn in terms of hover capability (in weight and altitude), speed and rate of climb. This information is to supplement the operator's manual and help the pilot better understand and interpret the Kiowa's capability within the operating limitations. When TOT is above 600 degrees C. the following rules of thumb apply under most conditions

RULES OF THUMB

HOVER

- For each degree of TOT remaining, approximately 10 pounds may be carried, or:

  20°C TOT (one increment = 200 pounds on the gauge)

- For each degree of TOT remaining the OH-58A can hover approximately 50 feet higher, or:

  20°C = 1000 feet

SPEED

- For each 10 degrees of TOT remaining, speed can be increased by approximately 2.5 knots or:

  20°C TOT = 5 knots

RATE OF CLIMB

- For each degree of TOT remaining, the rate of climb at 54-knots TAS can be increased by approximately 10 feet per minute, or:

  20° TOT = *150-200 feet per minute

*Depends on gross weight

NOTE: Each of the Rules of Thumb is also true for a 5-psi increment on the torquemeter.

HOVER DOWN

CW2 Richard L. Hobson

OUR HUNTER/KILLER team had been working since first light and we were getting a little tired by late afternoon. Both of our OH-6A light observation helicopters (LOHs) were still mechanically sound, however, so we decided to accept one last mission before returning home.

Some visual reconnaissance needed to be done for a unit that had experienced light to moderate contact for the past few days, and the mission was to seek out the remaining enemy elements. We expended 30 percent of our ordnance after receiving a few short bursts of small arms fire during the first few passes, then had negative contact during the remaining 45 minutes of the visual reconnaissance mission.

I then advised the ground unit of the mission completion and asked if our team could be of any more assistance. The ground unit's radio/telephone operator (RTO) informed me that they were low on smokes and C-rations and requested that we see if a UH-1 Huey could get into a landing zone (LZ) they had cleared the previous day.

It took only one pass to see that the only way a Huey could get in there would be to crash. I reported this information back, thinking that would end the matter, but was then asked if an LOH could get into the area. So back I went, thinking that it was rather foolish to risk a chopper and crew just to supply a few cases of smoke.

As I reconned the area I saw that an unloaded LOH could make it in by doing an approximate 130-foot hover down, definitely not worth an ash and trash mission because an LOH would only have about an 8- to 12-inch clearance on each side of the rotor and only about 2 feet for the tail boom on the initial entrance. Also, one of our LOHs had been shot down nearby on the previous day by .30 caliber fire. To put it mildly the area was hot and tight, definitely not a place in which one enjoys lingering.

After making an appraisal of the situation, I informed the RTO of my findings and opinion of the proposed LZ. As I was preparing to break station with the ground unit, my high bird, an AH-1G HueyCobra which had been in contact with the ground unit's battalion commanding officer, informed me that there was a line 2 (seriously wounded) case on the ground. I advised the RTO to get his CO on the radio.

It took only a few seconds to confirm that they did have a serious line 2 that needed to be medevaced immediately. I was also informed that the RTO was new on the job and was just a bit confused as to what was happening.

My crew and I decided to attempt a hover down, although one of my crewmen would have to remain behind while the medevac mission was being performed due to the weight problem.

As I made my last recon pass, I noted that the aircraft was now down to 160 pounds of fuel (full load for an LOH is 400 pounds) which gave us an extra 240-pound margin. The wind was light and variable, again Lady Luck was smiling at us. One factor not in our favor was that only about 1 hour of daylight remained. However, this was ample time if the mission went more or less as planned.

With this in mind and my heart in my throat, I advised my high bird and the commander of our decision and began to hover down.

For the first 30 feet down things looked pretty easy. My crew chief, standing on the right skid, was giving instructions for positioning the aircraft. At about 30 feet down he advised me to move forward 3 feet to keep from connecting with a branch of mahogany. After moving forward we continued down another 20 feet and again had to move forward, this time approximately 8 feet. With a 30-degree heading change we were now about 80 feet above the ground.

Starting down again I glanced overhead and was horrified to see nothing but trees, limbs and very little blue sky. A go-around at this point would have probably proven fatal due to excessive weight—we were between 2,200 and 2,300 pounds due to mission requirements.

By now the crew chief was giving directions as fast as he could. The next 30 feet went by rather easily with only one 5-degree heading change.

I was beginning to feel a little more relaxed when suddenly I noticed a very distasteful looking tree about 5 feet under my chin bubble. I informed the crew chief of the new problem and was then advised that we could possibly move to the rear 10 feet, which would just clear us of our forward obstacle. The one catch was the tail rotor clearance, only about 1 foot on each side. We were still 50 feet from touchdown and a tail rotor failure would probably have meant disaster. With sweat dripping from my forehead, we finally managed to bypass the tree.

As we neared the ground I spotted about 12 smiling troops crouched in their defensive positions. One of them jumped up and guided us the rest of the way in. With the skids on terra firma (blown away bamboo) we all breathed a sigh of relief. I glanced at my watch and saw that our hover down had taken approximately 8 minutes.

I elected to keep my crew chief on board for directions since he was experienced, so the observer unstrapped and took the M-60 machine gun and the rest of the ordnance off. This reduced the weight about 200 pounds. The line 2 was loaded aboard, apparently the victim of a mine which had really done a job on his back. You could tell that he was in extreme pain, but he did manage a slight smile of thanks.

Just prior to takeoff I noticed we were down to 130 pounds of fuel. As we lifted off it was readily apparent that the bird was much more responsive due to the decreased weight. I also noticed my observer was now dug in on the ground.

The flight out seemed at least three times as easy as the one coming in. Our intended fire base with a doctor was only 10 minutes away, so things were going pretty well.

After dropping the line 2 off, we proceeded to the ammo dump and started loading (the CO had requested as many smokes and grenades as possible). Afterwards I made a hover check and found that I could almost hover at 1 foot using 3 pounds of torque under the redline.

We quickly unloaded two cases of smokes and one case of grenades. This time the hover check was acceptable and as we lifted off there was 100 pounds of fuel remaining, just enough to complete the mission with a little to spare. This was another lucky break because now the sun was almost down and it would have been impossible to get in after dark.

As we again approached the LZ the crew chief positioned himself to vector us in. It was very gratifying to see that our letdown was much easier this time due to our knowledge of the area.

The unloading of the M-79 rounds and smokes was uneventful. Our observer happily climbed aboard and we departed with much relief.

As we were on short final the 10-minute warning light came on. *Things had really worked out just right.*

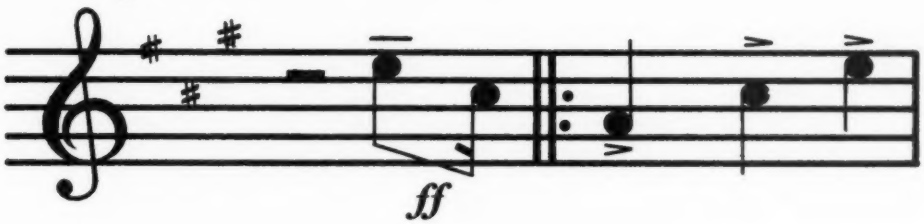
Aeromedic

Provided by the Society of U. S. Army Flight Surgeons

Major Nicholas E. Barreca, M. D.

The 1970 edition of "Accident Facts," a magazine published by the National Safety Council says that during 1969 about 20 percent of the automobile accidents were caused by failure to yield the right of way. Some of these were the fault of drivers who, for some reason or other, did not heed the "Stop" or "Yield" signs. But many were caused by drivers who came up to the intersection, stopped or slowed, looked both ways to see if something was coming and proceeded through right in the path of an oncoming vehicle. Why? The answer is that they did not see the other car. In some ways each of us is a "little bit blind"

Oh Say, Can You See?



To the air crewman: Did you ever look for something and finding it right "under your nose" wonder how you missed *seeing* it? Perhaps it *was* "behind" your nose! Occasionally another might say, "What are you, blind or something?"—not realizing how true that statement might be. Actually, each of us is a little bit blind! This condition, while certainly a frail human limitation, is nevertheless a normal and necessary consequence of the eye's structural makeup.

The anatomy (structure) of the eye is simple, but unique. The inner surface of the eyeball is lined with a *light* sensitive layer of nervous tissue called the retina. This layer is much the same as the film in a camera and contains specialized light receptors called rods and cones. The rods and cones are the cells responsible for sending light images to the brain. They send their messages through avenues called nerve fibers. The fibers cross the retina and exit the eye on their way to the brain. This point of exit is called the optic disc. Light enters the pupil or keyhole of the eye and is projected to a focus on the retina by the cornea and lens. If one was to peek through the keyhole (pupil), in much the same way as a flight surgeon using an ophthalmoscope, he would see the curious sight in figure 1.

To one side, the pale yellow optic nerve head (optic disc) is seen, from which a network of arteries and veins radiate out and stream across the retina. The optic disc and blood vessels are not sensitive to light, thus they are projected into our field of vision as blind spots, known medically as scotomas. Luckily, the most sensitive portion of the retina, known as the macula and fovea centralis, are not interfered with in this way. A concentration of cones at the macula is responsible for 20/20 visual acuity and central vision. The visual blind spots are projected into our peripheral (side) fields of vision where visual acuity becomes as poor as 20/200*. Thus, our most sensitive vision is not usually obscured when both eyes operate together providing us with binocular vision. This is because the blind spot in one eye is covered by vision in the other eye.

Under certain conditions of sloppy viewing or scanning it is possible for our potential blind spots, especially the one resulting from the optic disc, to obscure vision. This can be vividly demonstrated by the examples below:

First, looking at figure 2 hold this page about a foot in front of your eyes. Close your left eye and look steadily at the pedestrian while moving this page slowly toward you. The car disappears! Now close your right eye and look steadily at the car while moving this page slowly toward you. The pedestrian disappears!

Next, pick a point across the room. Extend your right arm with the thumb extended upward. Close your left eye and place your thumb so that it supports the visual point of regard (like a target on a rifle sight).

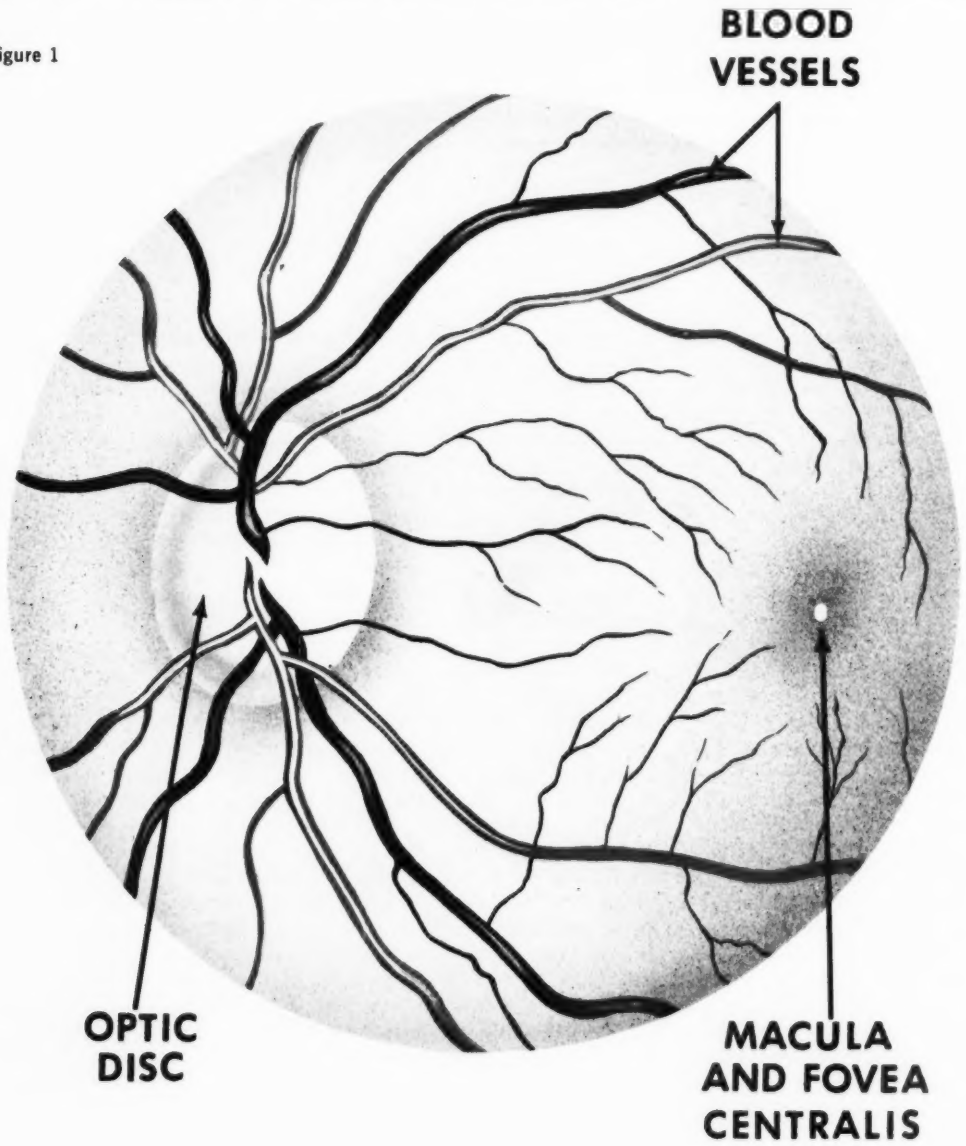
Now continue to look at the point with your right eye alone as you move your thumb slowly to the right. Your thumb disappears!

As your blind spot is projected in the distance, it becomes larger and larger in terms of the size object that it might conceal in the distance. The blind spot is a circle about ½ inch in diameter at 8 or 9 inches. This circle of blindness, when extended to a distance of 200 feet, is about 6 feet in diameter. Thus, at 200 feet it could swallow a car or small aircraft. At 100 meters it could conceal a UH-1D/H.

All very interesting, but how can you, the two-eyed oggling man, get into trouble? Well, some of us are endowed (perhaps burdened) with prominent noses. The bridge of the nose can prevent the opposite eye from covering the blind spot of the other. In addition, the eye has other limitations, particularly when it is rapidly scanning.

First, retinal images do not register sharply when the eyes are moving. The image is

Figure 1



blurred. This is why spinning dancers or skaters snap their heads a full turn for a split-second focus on a point to prevent nausea and dizziness.

Next, the eyes can only focus clearly on points about 45 degrees from central fixation (even though our binocular field of peripheral vision is 180 degrees or more). Thus, clear, sharp images are received only when we are looking directly at an object of regard and dwell on it for a few instants.

device called the tangent screen to measure an indivudual central field of vision. This test is performed with one eye patched and the individual seated one meter away from a fixation point on a black background. A small white target, usually one to two millimeters in diameter, is moved through the predetermined meridians on the screen. The flight surgeon can thus determine the position and size of both normal and abnormal "blind spots" of the examinee.

Figure 2

Here's how your scotoma (blind spot) and other limitations can blank out an oncoming car or aircraft at 200 or 300 feet from your left or right. You pull up to an intersection and stop. Hurriedly, without moving your head and neck, you glance to the left and right. An oncoming car 200 to 300 feet away would not register while your eyes are moving. You momentarily focus on a point about 45 degrees to the side. At this point the bridge of the nose prevents the opposite eye from covering the blind spot *in which an oncoming vehicle could be hidden.* Thinking you are clear you start through the intersection. The oncoming vehicle is seen in your peripheral vision as you move into the intersection. By then it may be impossible to prevent an accident because the vehicle, which was hidden in your blind spot, will need 243 feet to stop at a speed of 50 miles per hour. BLAM! You've done bought yourself an accident!

So there you have it! You too have a blind spot. Your flight surgeon can easily demonstrate it for you if you must be shown more dramatically. He uses a

The normal blind spot was discussed above. There are many causes of abnormal blind spots. Some result from abnormal enlargement of the "normal" blind spot. This can be caused by an increase in the intraocular (inside the eye) pressure, such as from glaucoma. Many types of blind spots can be caused by abnormal pressure or certain inflammatory diseases and toxic agents. Injury to the eye can sometimes result in scotomata. The amount of vision lost depends on the location and the degree of overlap from the normal eye.

These blind spots and the normal one should not be confused with the "night blind spot." As mentioned before, the retina is composed of rods and cones. The cones are the specialized receptor cells that are responsible for the very acute vision necessary for reading. They are also responsible for color vision. The problem with cones is that they are unable to "see" in low or dim illumination (starlight). Since the cones are crowded and concentrated in a small area on the retina (the macula) along the central visual axes of the eye, darkness will produce a blind spot wherever the macula is projected into our night visual field. The normal blind spot, due to the optic disc, is present all the time. The night blind spot occurs only when we stare at an object under very low illumination. Thus, at night we have two blind spots.

As an old pilot adage goes, "Keep your head on a swivel." With all of our limitations it's a wonder we see at all. The use of some precautionary steps will increase your seeing ability and decrease the likelihood of catastrophe.

- Under daylight conditions look in the direction you wish to clear visually. Turn head and neck as well as eyes so that binocular vision covers the blind spot.
- Establish a consistent and methodical scanning pattern in daylight. Scan from left to right, top to bottom in overlapping areas, hesitating at each point and *looking* for several seconds.
- Avoid a sweeping "radar-disc" scanning pattern. All you will see is a blur which may conceal the small discrete image of a distantly approaching aircraft.
- At altitude there may be nothing within view to visually fix upon. This can cause a condition called space myopia or nearsightedness due to overaccommodation. *To avoid this* one should look at the ground from time to time or at a distant cloud or even a wing tip (provided it is as much as 20 feet away). Thus, your eyes will be focused for distance when an aircraft comes into your scanning pattern.
- At night a different scanning pattern must be adopted. It must still be consistent and methodical from left to right, top to bottom in 10-degree overlapping circles. The major difference is

the avoidance of staring or looking for more than an instant. Staring causes the night blind spot to cover the area to be viewed. Once a target is acquired by silhouette in the peripheral or side fields of vision, it can be followed by looking 10 degrees to the right, left, above or below it to avoid the night blind spot as well as bleaching out the rods.

• Finally, if blind spots in your visual field become apparent under other than the "normal" conditions described above, seek the advice and examination of your flight surgeon. The life you save may be your own!

To the flight surgeon: In a previous issue of AVIATION DIGEST ("Aeromedic," April 1970) the combined use of the clear plastic helmet visor and N-15 sunglasses was recommended for dual protection against brightness and injury. Some inquiring minds have wondered about the extent of reduction in transmitted light resulting from this practice and the impact of this limitation of flying safety.

Light transmission through the windscreen of UH-1 aircraft approximates 87 percent. Since light transmission through the N-15 sunglasses is approximately 15 percent, the ultimate light reaching the eye would be 13 percent of that incident upon the aircraft windscreen. This figure is well within the desired limits for light transmission through sunglasses, the range which is generally given to be between 10 to 15 percent. Even under conditions in which the combination of the clear polycarbonate helmet visor and N-15 sunglasses is used, an ultimate light transmission of 11.35 percent would be realized. Again, well within the suggested limits for conditions of bright sunlight.

At night the use of a clear visor would ultimately result in the transmission of approximately 80 percent of the light incident upon the aircraft windscreen. Thus, at night the clear visor is best used on takeoff, landing or when the risk of hostile fire is evident. A number of incidents have been reported in which the only injury sustained by an air crewman was to his visual apparatus. These occurred under hostile fire conditions where the air crewman, failing to use his helmet visor for protection, was struck by extremely small, but damaging, metal fragments. For the simple lack of eye protection these air crewmen sustained serious eye injuries, many with visual loss so great as to preclude flying.

Occasionally through misappropriation air crewmen will acquire and use helmet sun visors intended for arctic or desert conditions. These visors will transmit only 5 to 7 percent of light incident upon them. The other military services frequently issue them for extremely bright environments (snow, sand, etc.), but they are not meant to be used routinely.

Looking at already existing charts for visual acuity plotted against illumination, it was estimated that on an average brightness day, even if light transmission were reduced to 0.1 percent, one would still have 20/20 visual acuity. An experiment was performed using the VTA near and distant visual acuity test. Two N-15 sunglass filters were placed over each eye (yielding a 2.25 percent light transmission). This resulted in no reduction in the observer's visual acuity. The light available in this situation was equivalent to 10-foot candles. An overcast day provides about 500-foot candles.

The contrast illumination of a target will ultimately determine our ability to see with 20/20 visual acuity. Under relatively bright days, reduction in light transmission normally will not interfere with visual acuity. However, when total illumination is decreased and contrast between objects of regard and background is diminished, the use of sun visors, particularly those with low transmission (5 percent), might become a hazard to flying safety.

Since sunglass filters are being discussed, another potential problem area is worthy of consideration by the flight surgeon. If there is a 25 to 30 percent difference in light transmission between one side of a visor and the other, it is theoretically possible for disruption of true stereopsis to occur. This was previously described as the Pulfrich stereo phenomenon, and generally applies to the individual lenses of sunglass spectacles. When there is a large difference between light transmission from one eye to another, a swinging pendulum, rather than having pendular motion will instead appear to have elliptical motion (a change in apparent depth). This is what Pulfrich originally described.

This phenomenon was also tested using the VTA stereopsis test. A flight surgeon viewed the stereoptic circles with an N-15 filter over one eye and no filter over the other, thereby creating an 85 percent difference in transmission. This did not interfere with his ability to identify stereoptic circles. He then tested himself with a 12 to 13 percent difference between spectacle lenses, and again there was no disruption of stereopsis. However, this is a static test of stereopsis. The results under dynamic conditions were not

tested. It is under conditions of movement that Pulfrich described his illusions of depth produced by differences in light transmission between eyes. Thus, this phenomenon remains a potential hazard when air crew inadvertently mix sunglass lenses indiscriminately.

Standard issue sun visors are uniformly tinted to military specifications. They are seldom a source of the above phenomenon unless altered by the air crewman (i.e., application of commercial sprays or films). The accidental combination of sunglass filters of differing transmission is possible though remote. Flight surgeons should be alert to the accidental occurrence of this situation and warn air crew of the potential hazards created by the misutilization of otherwise useful and necessary eye protection.

There are a few abnormal conditions of the eye that can produce the Pulfrich stereo phenomenon as well. Monocular pupillary constriction is one, but this condition would usually be drug induced or traumatic. However, perhaps an individual with Horner's syndrome could present with depth perception difficulties. Other types of unilateral pathology can potentially cause the phenomenon. Opacification of the cornea or vitreous and early cataract might cause sufficient reduction in unilateral light transmission, while still permitting relatively sharp vision.

In summary, the following recommendations are offered for eye protection:

- Under bright sunlighted conditions all air crewmen should use sun visor or sunglass (N-15) eye protection.
- For general usage the combined use of the clear helmet visor and sunglasses provides ideal protection in sunlight, with the availability of alternative protection for night flying.
- At night the use of the clear visor will permit adequate light transmission for most conditions. However, it is recommended that risks versus limitations be weighed, choosing only those times when the potential risks are increased, i.e., takeoff, landings (normal and emergency) and when hostile fire is anticipated.
- Use only standard issue equipment for this protection. Avoid the use of scrounged equipment, which may have been intended for special purposes. The Army air crewmen's sun visors and sunglasses have transmission values of 15 percent.
- Refrain from applying comercial sprays or plastic films to sun visors or sunglasses. This could create a situation where difference in light transmission results in disrupted stereopsis. In addition, intolerable distortion results.
- Do not jerry-rig sunglass spectacles. Have them repaired with standard filters from authorized sources.

* Visual acuity or one's ability to see sharply and distinctly is tested with the use of a vision testing device called the Snellin eye chart. The letters on this chart are of such a size that the "20 line" can be easily read with one eye, by a person with normal visual acuity, from a distance of 20 feet. Thus, when an individual reads this line from 20 feet he is said to have 20/20 visual acuity. If he can only read the "big E" (the "200 line") his vision is poor, for he must come to a distance of 20 feet to read a letter the normal eye can see clearly at 200 feet. Thus, he is said to have 20/200 visual acuity.

INSTRUMENT CORNER

Q. At what point is an aircraft considered to be in the holding pattern?

A. The aircraft is considered to be in the holding pattern at the time of initial passage of the holding fix. (Reference: DOD FLIP, 1 Apr 71, section II, page 11-77.)

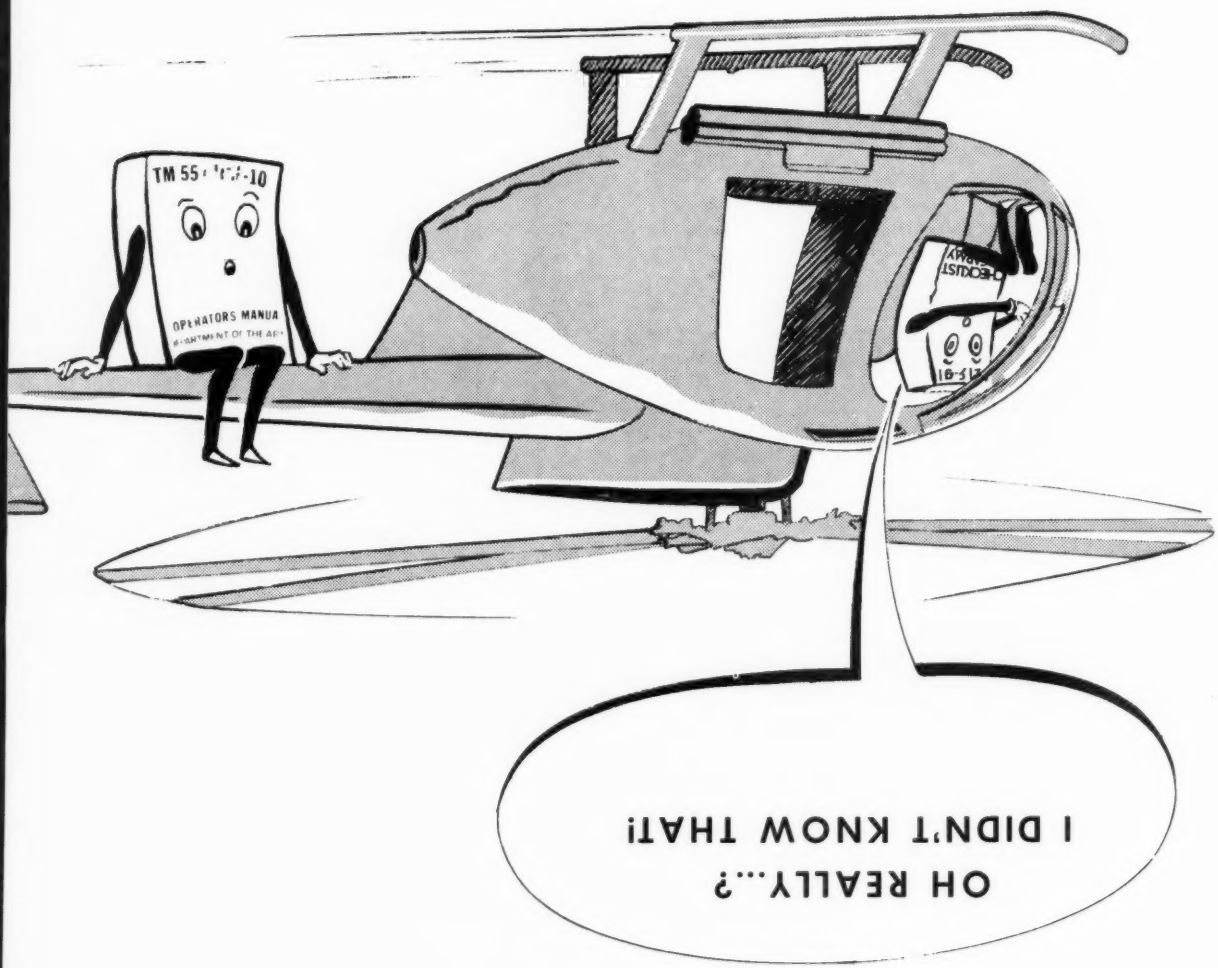
Q. When a pilot has been informed by ATC that his aircraft is in radar contact, and then is later handed off to another controller, is it necessary that the new controller advise that he has radar contact?

A. No, this fact will not be repeated to the pilot when handed off to another controller. At times the aircraft identity will be confirmed by the receiving controller.

(Reference: Airman's Information Manual, February 71 page 1-55, TB AVN, 24 Feb 71 1-761.)

Q. Is there a requirement that an ATC clearance be read back even when not requested to do so?

A. No, however, controllers may request that a clearance be read back whenever the complexity of the clearance or any other factors indicate a need. The pilot should read back the clearance if he feels the need for confirmation.
(Reference: Airman's Information Manual, February 71, page 1-42.)



Dear Danny: I noticed while reading the OH-58A manual, it recommends avoid operating in the 172 to 206 rotor rpm range. I understand why this range needs to be heeded in the OH-13 or UH-1 series with the stabilizer bar. The OH-58A does not have one, so what is the reason? There is no explanation in the manual.

1LT F. E. T.

Danny's answer: Man, did you give me a beaut! It took a long while, but here's what was explained to me. It seems this is a carry-over from the original LOH program (OH-4 manual) when they suspected a harmonic vibration in the tail rotor drive shaft system. However, the engineers I've talked to see no reason for this statement in the OH-58A manual since it has an entirely different type of tail boom and power train system; consequently, this caution range is not valid. Thanks to your query a DA Form 2028 is being submitted to correct this error.

Charlie and Danny's Write-In

You know, there are times you can't see the forest for the treees!

Dear Danny: On page 4-2, paragraph 4-118 of the CH-54A dash 10, it refers you to a figure 10-1 in reference to different types of bellmouths installed on the aircraft. How does an instrument takeoff chart, which figure 10-1 does display, give you this information?

CW4 T. B. D.

Danny's answer: Thank you for your sharp eyes. It was either an oversight or misprint. The correct chart made reference to in paragraph 4-118 of TM 55-1520-217-10/1 is figure 10-5, located on page 10-9. Just the other day we received a DA Form 2028 on the same matter. Say, if you run into any more items of this nature, how about submitting a DA Form 2028 as well as writing us a letter? We certainly would appreciate both.

Dear Danny: I've sent in some suggestions and 2028s on the CH-34C and haven't seen any changes lately. What is the story on this aircraft and when can we expect some of the recommended changes?

1LT O. H. D.

Danny's answer: As you know this aircraft is no longer on the active list of aircraft; consequently, changes and reviews are controlled by availability of funds and criticality of the proposed changes or 2028s. This aircraft has such a good reliability factor that few changes were submitted. But to answer your question, the manual is in the process of being revised to incorporate all recommended changes, including the dash CL. It is my understanding that unless funds or some unforeseen situation appears the proposed changes should be printed and in your hands in approximately 4 months.

Dear Danny: In the OH-6A what are the capabilities of the attitude indicator? We are unable to find it in the manual.

WO1 H. B. A.

Danny's answer: The information you desire is on page 2-25, paragraph 2-94 of TM 55-1520-214-10. It says the attitude indicator has a 360-degree azimuth and roll capability but only a 50-degree pitch range both upward or downward. Hope someone didn't remove that page from your manual by mistake.

Dear Danny: Since it is required that an aircraft be started with external power to conserve aircraft battery, why were the steps for connecting and disconnecting the external power unit omitted from the U-6A prestarting procedures?

2LT M. H. R.

Danny's answer: It is common practice to use the aircraft battery to start small aircraft engines like the one used in the U-6A. An external power unit is required only when the battery is dead or when operating in extremely cold climate. Information for the use of external power is given in paragraphs 2-72, 10-31 and 10-33 of the U-6A operator's manual (TM 55-1510-203-10).

Dear Danny: On the CH-54B it states when icing conditions are encountered, to open the bypass doors with EAPS installed. In our hangar flying sessions some people disagree with the manual. Who can we write to and obtain the correct information?

CW3 G. B. P.

Danny's answer: You came to the right place for the answer. I just returned from a manual review and the same subject was brought up. Testing the EAPS under icing conditions in the laboratory revealed that the EAPS bypass doors should not be opened and to land as soon as possible. Once ice develops on the bypass doors it may not be possible to open them. Change 6 to TM 55-1520-217-10/2, which was reviewed, will correct this erroneous information. It also contains other valuable information on the functioning and limitations of the EAPS under icing conditions. Hope this change, when it arrives, will clear up your hangar flying question.

It Could Be...

Roulette—exciting, adventurous, challenging and risky—but you may play it every day with not one but two chambers loaded. Remove the chocks, kick the tire and light the fire —that's all. Now sit back, relax and maybe, just maybe, this time the hammer will slam down onto an empty chamber—but keep smiling, there's always that next flight

Captain Marvin E. Riley

AT ABOUT 1630 hours we departed the air base in the Republic of Korea where we had been flying all day in a CH-47A carrying oil barrels to a mountain site. We had checked weather before we left, but failed to file a 175-1. We flew direct to Camp Carol, which took almost an hour of low level dodging in and out of small snowstorms.

Both the aircraft commander (AC) and I were tired, having been flying 10 hours that day, but we still had at least 1 hour and 10 minutes fuel. It was only 100 miles home and we could make almost 130 knots. The weatherman had said we would have 2,000 feet scattered and the moon was coming up. Besides, there was another base about 20 minutes south of our destination along our route which could be used if problems arose. So home we headed.

As we flew north the weather seemed to be improving, and at our checkpoint the moon was bright and we had plenty of fuel. Calling ahead, the tower operator reported 5 miles and clear. We could relax since we were all but in the chocks.

Before I go any further I

They'll Get You Too

would like to recreate the conditions in the cockpit. The AC was a warrant officer about a year out of flight school and rated for about 10 months, though he had less than 250 hours in the aircraft. His pink card had just expired. I was a brand new captain with considerably more time behind a desk than in an aircraft. Though I had been rated for the same amount of time, I had less than 200 hours in the aircraft. However, I had just renewed my tactical ticket. Though the automatic direction finder was inoperative in the aircraft, airport surveillance radar and precision approach radar were available from an Air Force base about 10 miles past our home base.

As we flew north the sky became darker and a few minutes later, while flying level at 2,200 feet, 120 knots over mountainous terrain, we entered a dense white cloud. The AC, who was flying, entered an abrupt cyclic climb. I went immediately to my maps and IFR Supplement in preparation for an IFR flight.

After a short period I returned my attention to the instruments. The air speed indicator was at zero, the attitude indicator was indicating 15 degrees nose high, the ball of the turn and slip indicator was on the far left end of the race and the turn needle was indicating a right turn. The vertical speed indicator, as I watched, went from 1,000 feet per minute (fpm) climb to 200 fpm descent.

I realized that the AC was attempting a 180-degree pedal turn with the intention of flying back out. I glanced down to my map to see what minimum obstruction clearance altitude would be to the south when I felt a sudden swinging sensation to the right. When I looked up the face of the attitude indicator was solid black. I looked over to the left seat attitude indicator and it also was indicating a steep dive. I looked back at my attitude indicator, incredulously waiting for the AC to react. After several seconds in this attitude I told the AC to get some aft cyclic and then asked for the aircraft. He made no reply. I looked down at the air speed indicator and watched the needle accelerate from 120 through 150 knots. I put my hands on the controls and began to apply a slight aft pressure on the cyclic, attempting to bring the horizontal bar on the attitude indicator into sight. Then we broke out in a valley between two mountains.

The tops of the mountains were well up into the cloud. I entered a violent deceleration, leveling the aircraft and decreasing thrust to keep from climbing back into the cloud. The aircraft shook violently and the rotor rpm must have gone extremely high. The aircraft leveled, heading directly toward a mountainside at an extremely high rate of closure. I put the aircraft over to better than a 70-degree left bank, pulled more aft cyclic and pulled in thrust. When I came out of the turn I leveled the aircraft at about 300 feet above the valley floor. The AC then took the aircraft and landed it in a frozen rice paddy.

Without shutting down the crew checked the aircraft and learned that the only apparent damage was to five side windows which had popped out. Since the damage was minor and we were unable to detect any abnormalities, we flew the aircraft 5 miles back to the base camp we had just passed.

The next morning I went out to inspect the aircraft in the light. I couldn't believe it. One of the aft rotor blades had a cordwise crack in it so bad that the only thing holding the blade together was the spar, which was clearly visible. Several of the tunnel covers on the top of the aircraft were missing and others had been punctured by the flex packs of the drive shafting. The shelf the battery sits on was bent at approximately a 30-degree angle. I had picked up this aircraft and flown it 5 miles.

In the past year I have thought of many things I could and should have done to prevent those few seconds of impending death, but they all work out to one common mistake: poor prior planning and complacency. You've heard them so many times before; they go in one ear and out the other. Keep it up—they'll get you too someday.

The views expressed herein are the author's and do not necessarily reflect the views of the Department of the Army

We Armed The Helicopter

Continued from page 6

Using the OH-13 helicopters available at Ft. Rucker, we evolved a standard air cavalry package for troop tests and demonstrations of tactical concepts. The caliber .50 was too heavy, so we settled for four caliber .30 aerial machine guns and four rockets per helicopter.

We did not really need four machine guns but were demonstrating aerial firepower and needed emphasis. Also, the old AN-M2 machine gun was subject to mechanical stoppages, particularly when we flew through edges of pine trees and picked up a few needles. The armament package and pilot crowded our payload capability. We desperately needed more lift, but would have to wait for the turbine engine.

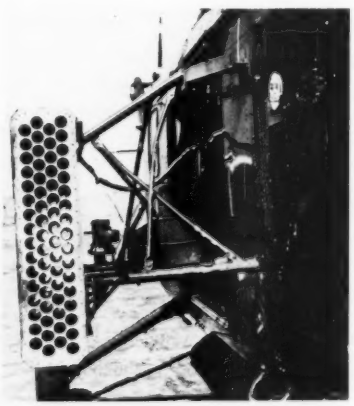
From 1956 to 1959 we scoured the country looking for weapons to test on helicopters. Any idea that looked reasonably feasible was tried. We mounted weapons on every type of helicopter available to the school. We employed obsolescent, standard and prototype weapons. Our friends in industry and the Army's arsenals pitched in to help. The Navy let us have everything we asked for except the Bullpup, which they later test fired from a helicopter. The Air Force, at lower levels, was very helpful providing us with supplies and advice.

Rocketdyne Division of North American had developed a 1.5-inch spin stabilized research rocket called "NAKA." It was never adopted, but Vertol packaged them on the H-25. Later when the H-25 was phased out of the inventory, we mounted the NAKAs on the UH-19.

We carried 132 rockets, plus machine guns. The warhead had a limited kill radius, but the system gave us a preview of the effects of the 40 millimeter weapons systems then in the R&D stage. We expended the world reserve of NAKA rockets in about a year in demonstrations at Ft. Rucker and at other Army installations.

The rocket people at Redstone Arsenal, Ala., had a prototype 2-inch folding fin aerial rocket. We tested it with both 6-foot and 10-foot launching tubes.

The 10-foot tubes gave a rea-



Above: The NAKA 1.5-inch rocket is fired from the H-25. Right: The NAKA rocket kit, including a .50 caliber machine gun, is mounted on the H-25. Far right: The same system was later used on the UH-19 which took part in demonstrations of tactical airmobility at Ft. Rucker and other Army installations. The world's supply of NAKA rockets was used up in about a year

sonable area fire accuracy of some 10 to 12 mils. But the warhead was too small for antitank and the weight and bulk penalties were considered excessive for antipersonnel. We soon expended the limited stock of rockets at Redstone Arsenal.

As we expended all available R&D and limited production rockets in the national inventory, we looked for other sources of weapons. There were two: the 2.75-inch folding fin aerial rocket and the 4.5-inch spin stabilized artillery rocket.

The 2.75 was a lightweight standard Air Force air-to-air weapon with a dispersion pattern comparable to a sawed-off shotgun—some 50 mils when launched at low or zero speeds. The warhead had a limited kill radius, but the rocket was easy to mount on the helicopter. By increasing the launch tube length from 4 to 12 feet, we reduced dispersion from 50 to 25 mils but produced an awkward package. The characteristic of the 2.75 that we really liked was the national inventory figure—there were some 8 to 10 million available.

The 4.5-inch artillery rocket warhead had a good kill radius and dispersion appeared acceptable for area fire. We rigged twelve 4.5-inch rocket tubes to the nosewheel strut of a CH-21. The machine guns were used to adjust rocket range. The tandem

★ ★ ★

The need for a weapons system to be used against hard point targets such as tanks resulted in the arming of an OH-13 helicopter (upper left) with the SS-10 wire-guided missile which was obtained from France. Tests were conducted by the U. S. Army Aviation Board (today known as the U. S. Army Aviation Test Board) located at Ft. Rucker. Interest then evolved to the newer SS-11, also a wire-guided missile (upper right). This became the M-22 system which is fired below in a test conducted at a Redstone Arsenal, Ala., range

★ ★ ★

Major General Bogardus S. Cairns (right), commandant of the aviation school and a cavalryman, located the last field manual written in 1936 for horse cavalrymen. Cavalry tactics such as those used (above) by the 102d Cavalry Battalion in 1941 maneuvers held in the Carolinas are the basis for today's airmobile tactics. The 1936 manual was rewritten incorporating air cavalry tactics learned at Ft. Rucker

rotor CH-21 appeared to be a reasonably stable platform for the artillery rocket.

Rock Island Arsenal, Ill., and the Ft. Rucker maintenance contractor installed machine guns and twenty-four 4.5-inch artillery rockets on the CH-34. Stationary firing from the ground indicated no structural damage to the aircraft although rocket blast and vibration did pop out some of the porthole windows. Once airborne, we fired pairs of two without appreciable change in attitude. When we tried to ripple three or more pairs we encountered a severe pitch problem and a slight yaw reaction. We did not experiment enough to determine precisely what our problems were because the 4.5-inch rocket was also being dropped from the Army inventory.

We were wary of the recoil and vibration of the 20 millimeter machine gun. Also, our analysis of the 5-inch high velocity aerial rocket's motor ignition time curve made it doubtful whether the rocket could safely be launched from zero air speed. The systems were tested and no one was hurt. However, machine gun vibrations shattered the firewall when the 5-inch rockets were fired. One grounded about 1,000 yards down range; the other was still climbing when it went out of sight.

Our earliest machine gun and rocket systems were mounted to fire straight ahead without elevation or traverse. We knew, of course, that some weapons would require inflight evaluation, depression and traverse controls. But incorporating these controls exceeded our blacksmith shop capabilities. Also, we did not have R&D money and if we went through formal channels it would take years to obtain any hardware so we turned to industry.

The General Electric Corporation plant in Burlington, Vt., agreed to help us at its own expense. General Electric developed a helicopter pod for two M-60 7.62 machine guns and eight of the 2-inch T-290 Redstone Arsenal rockets.

We ran out of 2-inch rockets, so we converted the pod for four 2.75-inch weapons. The pod gave us a +10 to -15 degree elevation capability. The weight penalty was 270 pounds. An electric switch on the control stick activated a motor on the kit and for the first time we could alter weapon elevation without changing aircraft attitude.

Our friends with General Electric and the Air Force picked up a B-29 gun turret, which General Electric attached under the forward fuselage of a CH-21.

Now we had elevation, depression and traverse. The copilot was the gunner. The package with two caliber .50 guns and 500 rounds of ammunition cost 650 pounds. The kit worked better for General Electric engineers than it did for our copilots. Malfunctions were due primarily to an inadequate source of electrical power in the CH-21. We were real proud of the system but a bit cautious about showing it. When we were alone it worked beautifully; when we had a packed gallery watching, it would malfunction.

One other weapon system should be noted. While we could provide area fire against soft targets, we still did not have a

weapon for hard, point targets such as tanks or bunkers. We joined with the U. S. Army Aviation [Test] Board (also located at Ft. Rucker) to send a team to France to study wire-guided missile gunnery employed by the French Army.

Bell Helicopter Company, Fort Worth, Tex., installed the French SS-10 on an OH-13. We conducted tests here and established the feasibility of the system. Of course, the French had already used it on the Alouette. They were then adopting the newer SS-11 (later designated M-22). Despite the disadvantages of a wire-guided system, we saw a potential antiarmor weapon for helicopter use—the only one then in sight.

On 5 March 1957 our team was augmented by a permanent sky cavalry platoon of 11 officers, 16 enlisted men and 10 helicopters (the personnel and the helicopters were taken from the aviation center resources).

Airmobile tactics and concepts spread throughout the Army and upward in military channels. As commandant of the U. S. Army Aviation School in the early 1960s, Major General Ernest Easterbrook (above left) continued the practice of opening training exercises to the public and high officials to familiarize as many as possible with the potential of Army airmobile concepts. Here he chats with Assistant Secretary of the Army Paul Ignatus during an exercise in 1961 at Ft. Rucker. Colonel Dutch Williams (center) was assistant commandant of the school. A year later the Army Tactical Mobility Requirements Board under Lieutenant General Hamilton H. Howze (below) recommended division-sized air cavalry forces

Far left: Major General Harry Kinnard who commanded the 11th Air Assault Division (T) at Ft. Benning, and later took it to the Republic of Vietnam as the 1st Cavalry Division (Airmobile). Left: Brigadier General Robert R. Williams who commanded the Test Evaluation and Control Group, Project TEAM, which evaluated the 11th and wrote up the afteraction reports

We graduated from R&D to mass production. Each pilot and crewman became a machinist. The post machinist along with 27 enthusiastic, yet inexperienced, assistants worked day and night until we had an armed platoon flying. Army aviators flew across the country to locate weapons, solenoids, gunsights and metal stock.

The new platoon, including the R&D weapon ships, was officially unveiled on 6 June 1957 at Ft. Rucker before an industrial-military group in a symposium sponsored by the Association of the United States Army.

In November 1957 the unit was redesignated the Aerial Combat Reconnaissance (ACR) Platoon Provisional (Experimental). Then in March 1958 the platoon was expanded to a full company or troop size unit and the title was changed to the 7292d Aerial Combat Reconnaissance Company (Experimental).

By 1958 we had our own machine shop. We had collected over 1,000 guns and hundreds of bits and pieces of rocket pods, gunsights, intervalometers, etc. With 100 blacksmiths we soon had an armed helicopter company ready to fight.

The airframe people, Army arsenal specialists and industry personnel monitored, listened to our problems and went home to design something more sophisticated.

The development of our tactical doctrine is a long story, but a simple one. The most obvious assets of the helicopter were not always readily understood. The

CH-47 Chinooks played key roles in the 11th Air Assault Division's test of airmobile concepts

Left: An AH-1G HueyCobra gunship of the 2d Battalion, 20th Artillery's (ARA) B Battery joins a Nighthawk searchship in 1st Cavalry Division (Airmobile) operations in the Republic of Vietnam. The helicopter armament concepts of the 1950s were proven valid in the 1960s in Southeast Asia

vertical rising machine could operate in confined areas of the forward battlefield. It is an agile, responsive device. It has a high battlefield speed ratio compared to trucks and tanks. But *most* important of all, a ground commander could be divorced from the obstacles of terrain that have restricted him for centuries. We learned that a former barrier becomes an avenue of approach. Freedom of maneuver in the "X" and "Y" coordinate dominates air cavalry force tactics.

While our task organization followed Wellington, the Navy influenced our tactics. Surface Navy forces are also free to maneuver in any direction on the horizontal plane.

There is a grey area between strategy and tactics, and another grey area between tactics and techniques. To avoid years of research of cavalry tactics we in combat developments adopted a cowardly approach. We plagiarized the last field manual written for horse cavalrymen in 1936. The younger people had never seen it; the older ones had forgotten it. Major General Bogardus S. Cairns, then commanding Ft. Rucker, was a cavalryman. He located the manual for us.

Chapter by chapter we rewrote horse cavalry tactical doctrine into air cavalry incorporating our lessons learned. When finished, we published the "New Tactical Doctrine" as a training text. We modestly refrained from advertising our source of genius. Some time later when a field manual had to be written on short notice our air cavalry training text was available and used, including some passages that I would have preferred to rewrite.

Concurrent with our tactical tests and hardware exploration, we demonstrated our ideas for military and civilian scientific and industrial leaders at Ft. Rucker, Ft. Benning, Ft. Knox, Ky., Ft. Bragg, N. C., and Ft. Bliss, Tex.

With the constant movement of military leaders our ideas were transferred to Europe and the Far East where others began their own tests. As our pilots moved to other stations, they carried the ideas with them. Thousands of ideas and theories were tested.

The revolution from the bottom spread upward in military channels. By 1960 the Army was spending R&D money on helicopter weaponry. Then in 1962 the Secretary of Defense Robert S. McNamara called for a quantum jump in Army mobility. The Army Tactical Mobility Requirements Board, under Lieutenant General Hamilton H. Howze, was convened at Ft. Bragg to develop and recommend courses of action to take. The board met, studied, analyzed and tested the problems and recommended division size air cavalry forces.

With the Department of Defense's blessings, money, people and equipment became available. Major General Harry W. O. Kinnard moved a cadre to Ft. Benning and organized the 11th Air Assault Division (T) for airmobility tests. Later his division became the 1st Cavalry Division (Airmobile) which he took to the Republic of Vietnam for the real test. The airmobile division proved to be an undisputed success and justified the faith that the late GEN Hutton had placed in armed helicopters and airmobility just 10 years earlier.

Next month the DIGEST continues its coverage of the history of the armed helicopter with Part I of "The Armed Helicopter Story" by Lieutenant Colonel Charles O. Griminger

Mission Of Mercy: Pakistan

When disaster strikes it is incumbent upon all of us to do what we can. Such was the case when the 182d Aviation Company at Ft. Bragg, N. C., was called to aid East Pakistan in the wake of tidal waves and torrential rains. At right, a UH-1 mercy ship drops supplies to survivors

CW2 Stephen P. Miles

LAST NOVEMBER tidal waves and torrential rains hit the islands and coast line of East Pakistan. When the waters finally receded, the full impact of the disaster hit a stunned world. Hundreds of thousands of people had been killed and thousands more left homeless. Entire villages and towns had been wiped away without a trace. The catastrophe, already labeled as the greatest natural disaster of the 20th century, called for immediate action to prevent thousands more from dying of starvation, exposure, and cholera and typhoid epidemics.

The United States answered the Pakistan government's call for aid with food, medical supplies and, perhaps an even more important contribution, a means of immediate transportation to get the supplies to the suffering populace. The 182d Aviation Company (Assault Helicopter) was alerted at Simmons Army Airfield, Ft. Bragg, N. C., for immediate deployment to Pakistan. Working through the night company personnel loaded giant Air Force C-141 aircraft with an initial lift of four UH-1H helicopters. In the next 2 days four more helicopters, a total of 63 personnel, four vehicles and personal baggage had been airlifted to East Pakistan.

One hour and 15 minutes after touchdown in Dacca, the capital city of East Pakistan, the 182d Aviation Company had a helicopter mission ready. This was a superb effort by maintenance personnel—considering that main rotor blades, mast, hub assembly, swash plate assembly, tail rotor and antennae had to be replaced before flight.

The Pakistani army coordinated flight missions and directed helicopters to areas hardest hit. It was found that a forward base of operations was needed near the coast line to reach the devasted outer islands and 182d Aviation Company personnel worked with the local army to lay out an excellent heliport. Before long Maijdi (Caveman) International Heliport was a haven for aircraft from Germany, France, Iran and the Soviet Union, in addition to U. S. Army and Pakistani helicopters.

Caveman was complete with a POL point, operated and maintained by 182d Aviation Company maintenance personnel, two-way radio communications and, due to the lack of suitable navigation aids, a rotating beacon was installed atop a 50-foot pole. Since East Pakistan is a country of level or gently rolling hillocks, this beacon was visible 30 to 45 miles from the heliport, a very important factor to aviators flying over unfamiliar terrain with inaccurate tactical maps.

Delivery of food supplies was of primary importance. The U. S. Ambassador to Pakistan, Mr. Joseph S. Farland, greeted the American contingent upon its arrival in Pakistan and flew on the first mission incountry. The UH-1 Huey laden with 10-pound sacks of rice was unable to land to deliver the food due to the starving population's refusal to move away from the aircraft. The helicopter remained at a high hover and dropped supplies.

From the air the full impact and depth of the catastrophe quickly became apparent. Hundreds of people and thousands of cattle still lay dead across the landscape. The remains of destroyed homes and even concrete commerical buildings gave mute testimony to the destructive force the tidal wave had on the outer islands. (Unofficial estimates have placed the initial wave at 20 to 40 feet *above the highest point* on most of the outer islands.)

Everywhere American aviators flew people gathered in immense crowds to collect food, blankets and medical supplies. For some it was their first substantial meal in 10 days. The first missions had to be flown on a door-to-door basis to reach those who were too weak to come to the helicopters. During these operations the danger of tail rotor strikes was always high due to civilian personnel gathering close to the aircraft. The word "DANGER" was placed on all tail booms near the aft

rotor to warn the populace. It was printed both in Bengali, Pakistan's predominant language, and English. In the 30 days the Americans flew in Pakistan, we did not have one incident with Pakistani nationals . . . an outstanding safety record for any mission but even more so considering the extreme conditions under which the helicopters had to fly.

Maintenance personnel at Caveman International Heliport pulled all aircraft inspections and daily maintenance with superior speed and accuracy and enabled the 182d Aviation Company to fly missions 7 days a week during the entire month. The only outside work not done at the heliport was an engine change which necessitated a flight to the East Pakistan capital to complete. Major William A. Hall III, the 182d Aviation Company commander and the mission commander, had nothing but praise for the fine efforts of his maintenance people in keeping all aircraft available during those first critical weeks.

Some aviation personnel were sent to Dacca to act in liaison with the Pakistani government and the small American colony living there went all out to make the aviators feel at home. Food available to Americans in Pakistan calls for a drastic change of diet and a liberal outlook on just what a gastric delight includes. Wives of American embassy personnel worked hard to bring an American touch to the diet and the U. S. Information Agency provided films and books to the aviation group for entertainment.

Initially the helicopter company was expected to stay until the Pakistani government felt the worst of the crisis was over. Due to the intense effort put forth by all concerned, it was decided that the aviation contingent could depart after only 30 days, far short of original estimates.

Missions continued to be flown up until the final departure date using a gradual phaseout to ensure that at least one helicopter would be available on the last day of flying. Final statistics for the 30-day period were exceptional. Over 17,300 passengers were airlifted in American helicopters alone. In 1,259 sorties an astounding 1,111,295 pounds of blankets, food, medical supplies and clothing were carried. A total of 663 hours were placed on the eight aircraft. The aviators and their equipment returned to the continental United States over a span of 4 days and were welcomed back to Ft. Bragg by Lieutenant General John J. Tolson, Commanding General, XVIII Airborne Corps and Ft. Bragg, with a hearty and sincere, *"Well done!"*

ANOTHER FIRST

(And We Hope The Last)

Occasionally a near miracle occurs, however, it is most often attributed to a lot of forethought and labor. The impossible is made possible by Army aviation. It will be recorded in the annals of history, but hopefully will never need repeating

Major John L. Wood

IT WAS A HOT, sultry Sunday afternoon in the Mekong Delta in the Republic of Vietnam. The rainy season was drawing to a close, yet the canals, rivers and rice paddies were still swollen.

A CH-47B Chinook from the 271st Assault Support Helicopter Company was performing a series of resupply sorties to a South Vietnamese infantry unit located on Nui Dai Mountain at the northwest corner of Military Region IV. One sortie in particular generated great anxiety among the crews. As the Chinook turned toward the mountain on its final approach with 35 troops aboard and a 5,000-pound external load of concertina wire and fence pickets, a .30 caliber round tore into it just aft of the right forward cabin window. It continued through the roof where it cut 14 wires of an electric wire bundle.

The number 2 engine lost power and number 1 went to full power. A right turn down the mountain slope to friendlier territory was made. The external load was released after it was apparent that the aircraft could not maintain altitude.

With the number 1 engine operating at full power, the aircraft could not be slowed below 110 knots in straight and level flight. Either a running landing or an autorotation would be required. The former was chosen because of the number of passengers aboard and the fact that the crew was not certain what other damage may have been caused by the hostile fire. Then the aircraft commander noted an abnormal increase in the vibration level of the aircraft and decided to land at a nearby asphalt airstrip.

On short final, just over the runway overrun, the number 1 engine was brought to idle and the aircraft touched down on the runway with a ground speed of approximately 125 knots. Rolling only on the aft gear to effect aerodynamic braking, the crew experienced a feeling of success. Rotor rpm diminished and the forward gear touched down. But when brakes were applied the aircraft skidded off the short asphalt airstrip, through the dirt overrun and into water at the end of the airfield.

At about 50 meters from the airfield the aircraft came to a turning halt. While it shipped water rapidly through the open cargo hook hatch and the broken chin bubbles, the crew and passengers made a hasty evacuation. The aircraft, with its rotor systems turning slowly, listed to the left, then sank on its side in 10 feet of water.

Photo 1: U. S. Navy frogmen attached recovery slings to the masts of the submerged CH-47B Chinook and the operation was underway

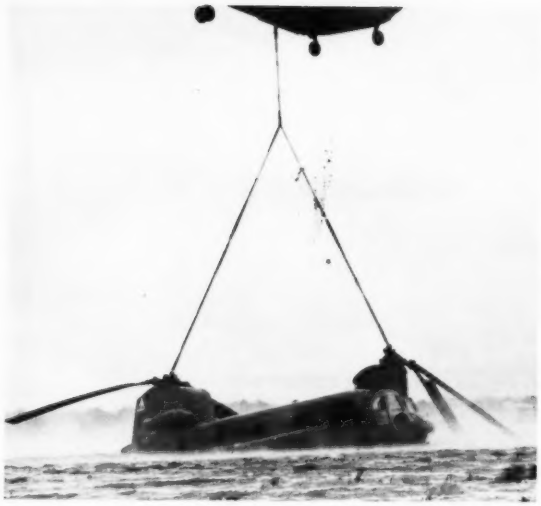


Photo 2: Left, the Chinook was rolled upright and nose high enabling water to drain

Photo 3: Right, beached but at a calculated 30,000 pounds, too heavy for a vertical lift

Here was a challenge for a recovery crew. According to official records this recovery would be the first for a Chinook which was in a rolled-over, submerged position. The challenge was to effect a recovery without causing further damage. To complicate matters there existed a significant hazard from the large amount of JP-4 fuel which was seeping from the aircraft's nearly full fuel tanks. On the plus side the airfield and its environs were tactically secure, aviation fuel was available at the field and there was not a pressing deadline to complete the recovery.

After viewing the crash scene in the afternoon, the assault support helicopter company commander, his operations and maintenance officers, the resident Boeing engineer and the Lycoming representative met in the evening to plan what was to become a very successful endeavor. Simply stated, the plan called for a 2-day recovery operation. On the first day the goal was to bring the aircraft to an upright position and move it to shore; on the second day it would be stripped of its heavy components and lifted by a CH-54 helicopter to a repair depot.

The first day's operation began when two U. S. Navy frogmen dived through the JP-4 fuel slick, removed the submerged rotor head covers, installed lifting eyes into the masts and attached recovery slings to the lifting eyes. The recovery slings were made using 20,000-pound load cargo slings and 40,000-pound load endless slings. These were fashioned 37 feet to the forward rotor head, 43 feet to the aft rotor head and with a 10-foot riser. This would assure a nose-high airframe attitude once the aircraft was upright. Another CH-47B from the 271st was used for the recovery. It was stripped of its cabin equipment and its fuel load was kept at less than 1,500 pounds.

The recovery Chinook was flown by the operations and maintenance officers who were in radio contact with the ground crew which controlled the entire operation with portable radios. A frogman hooked the recovery sling to the helicopter. The recovery pilots were instructed to maintain a direct vertical pull on the slings and to increase power slowly. Because of their smooth technique, the submerged helicopter rolled to the upright position (photo 1).

The configuration of the slings made the aircraft rise nose-high. With the helicopter in this position, a large amount of water was drained. The next and final phase for the day was the movement to shore. The aircraft, though still partially submerged and resting on the muddy bottom, was "towed" (photo 2) to

within 10 feet of the shore line by the recovery aircraft. It was there that the forward landing gear became mired in the mud (photo 3).

The dead weight of the helicopter, now in shallow water and partially drained of water, was calculated to be approximately 30,000 pounds—too much for a direct vertical lift by any recovery aircraft. With a few hours of daylight remaining, the rotor blades and heads were removed using the recovery aircraft and standard slings (photo 4).

That evening a progress session was held. The recovery goals were being achieved on schedule. Coordination was effected with a heavy helicopter company for the next day's evacuation of the aircraft to depot maintenance. Safety measures and precautions were again stressed. With the partially submerged helicopter still too heavy for a vertical lift, a two-point force would be the answer.

The morning of the second day a heavy wrecker (tow truck) was obtained. A bridle was fabricated using three 20,000-pound load cargo slings configured into three 40-feet legs centered on a 40,000-pound load endless sling.

Photo 4: The rotor blades and the masts are removed preparing for the final lift

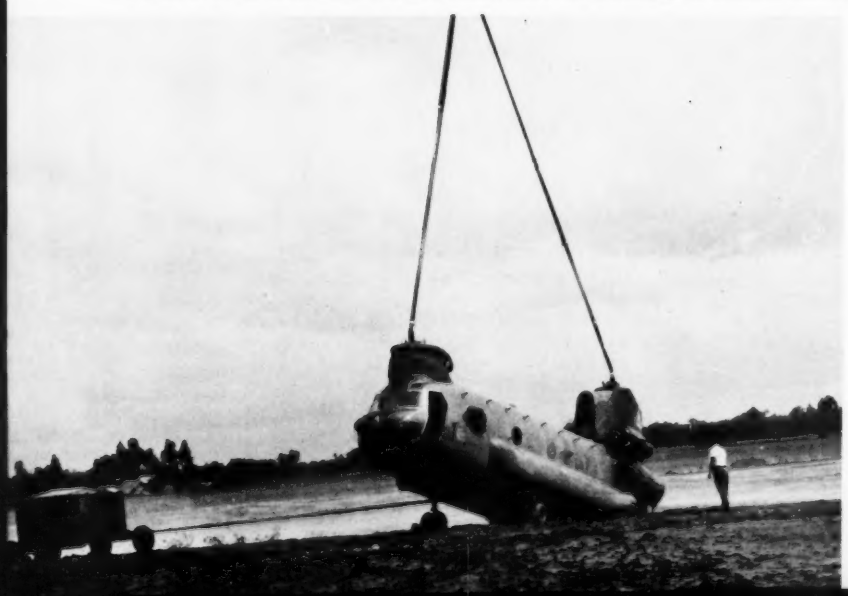
One leg was attached to the wrecker; the other two to the forward landing gear of the mired helicopter. Recovery slings used on the first day were once again attached to the masts of the downed aircraft. With the recovery aircraft exerting a vertical pull, and the wrecker a horizontal pull, the downed aircraft was moved up onto the airfield (photo 5).

Success! All drain holes in the bottom of the helicopter were opened, releasing much water. The engines and combining transmission were removed using the wrecker. The aircraft was next rigged for movement by a CH-54 helicopter.

There's always a bit of humor that will come to light. That afternoon when the CH-54 lifted the rigged aircraft, the CH-54 pilot told the ground crew that his instruments showed the rigged aircraft to be 17,500 pounds. Computations made at the planning session indicated a figure of 14,700 pounds. Where was all this "extra" weight? Seems someone forgot to drain water from the structural compartments designed for the aircraft's auxiliary fuel tanks. This was quickly remedied! Exactly 48 hours after the crash the Chinook was on its way to depot.

This recovery was a total success—the result of careful, precise, unrushed planning. An assessment of the damage indicated that only the rotor blades and heads were nonrepairable. No damage was incurred during the recovery. Another first—we hope the last.

Photo 5: A tow truck and a recovery craft move the waterlogged Chinook ashore



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VIEWS FROM READERS

I think maybe someone should have a good long look at the priority system which was established for distribution of the SPH-4 flight helmets.

Not one single instructor pilot in the Contact Flight Division at Ft. Rucker was able to obtain an SPH-4 during the entire 2 years that I was stationed there. Some of the students had them, but only a few.

I received orders for RVN back in September 1970. I immediately went to the issue facility to draw my SPH-4. At last! They told me that I would have to wait until I arrived at my new unit in RVN. I have been in my new unit for some time now and I still am not able to get an SPH-4. They just are not available. Furthermore, current directives will not allow me to take it out of RVN if I should be lucky enough to get one before my tour is up.

When I ship back to CONUS I will be right back in the same old boat—DEAF!

CW2 Joseph G. Welch
Aviation Safety Officer
HHC, 101st Airborne Div (Ambl)
APO San Francisco 96383

• Information received from the New York Army National Guard, Army Aviation Support Facility #1, Amityville, N. Y., advised that determination of the sizes needed in Nomex shirts and trousers for flight personnel at that facility has recently been completed. Requisitioning of the items is proceeding normally and no problem of supply is anticipated.

Stocks on hand of the K-2B coveralls and the APH-5 and APH-5A helmets are to be fully utilized before requisitioning of Nomex shirts and trousers and SPH-4 helmets. Stocks of B3A gloves are exhausted; normal requisitioning of Nomex gloves is currently in progress. The ACMA Supply Information Letter No. 1-71, dated 1 January 1971, contains information on these items. Information on helmets will be found on page 21 of this information letter and K-2B coveralls and Nomex flight clothing are noted in item 22 on pages 26 and 27 of the same publication.

The reported availability of Nomex flight clothing from a civilian source at a price of $14.00 per uniform apparently refers to material that did not meet specification standards and was rejected for Army use. The contractor disposes of this type of material through non-military outlets. They are not authorized for use by Army personnel due to deficiencies that caused their rejection when produced.

Life support clothing and equipment that does not conform strictly to the specification as written and is not approved for delivery on inspection may not give the protection it was designed to provide. Purchase and use of such substandard equipment may well endanger the wearer in the performance of his duties.

Coming Next Month: The Benefits Awaiting The Aviator In The Reserve Components

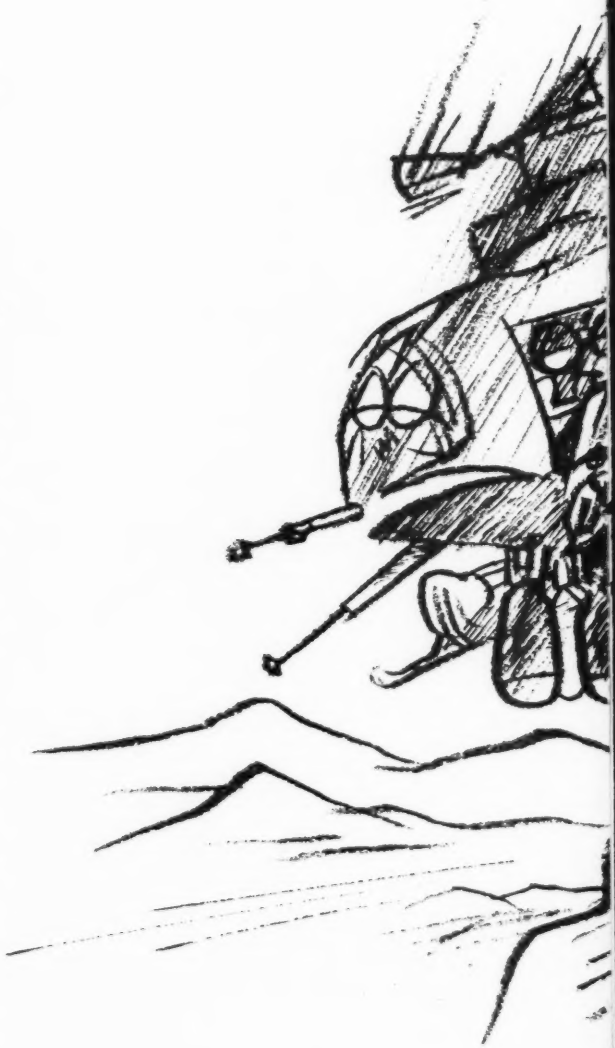
IF YOU WERE TO take a notion to try to crossbreed a Missouri mule with a butterfly there's no telling what sort of interesting critter you might come up with. You could be sure of one thing—whatever it might look like, it would have most of the characteristics and personality traits you normally associate with an Army helicopter.

Bone stubborn. Strong as Atlas. Skittish. Delicate as a flower in spring. Temperamental. And about as hard to handle as a box kite in a whirlwind.

Speaking of whirlwinds, that's a good part of the problem when it comes to handling helicopters. When you are at the controls of a helicopter you are quite literally riding the wind, a manmade hurricane which can flatten anything in its way. Normally, if you have sufficient altitude and plenty of elbow room there's no problem. When a helicopter hovering close to the ground on takeoff or landing begins to huff and puff it can cause trouble which makes the Big Bad Wolf look like a bush leaguer in the big wind department.

The big blow is only a part of the problem when it comes to hovering. Here is where the butterfly side of a helicopter's nature swings into action. Treat it wrong, hurt its feelings, ask it to carry a few pounds more than it thinks the union rules allow, and it will go into a temper tantrum which could do justice to a spoiled Hollywood actress. When this happens a helicopter will let you down.

Hard.



HOVER SENSE

Major Chester Goolrick

FACTS OF LIFE

Every budding aviator learns at his instructor's knee that when it comes to flying, hovering is only a mite more tricky than balancing an eel on the end of his nose while playing "The Stars and Stripes Forever" on a trombone. Just as we all pick up a lot of other hard facts as we trudge through this vale of tears which we promptly forget or ignore, to our ultimate sorrow.

Well, shucks, maybe hovering isn't all that hard. Few of us can play "The Stars and Stripes Forever," with or without an eel, but we do know everything there is to know about the fine art of hovering.

Or do we?

Well, *sure,* we know all right, or at least we used to. The trouble is we don't always let what we know get in the way of what we *do.* That's as good a way as any, for example, of explaining why so many helicopters in Vietnam have been

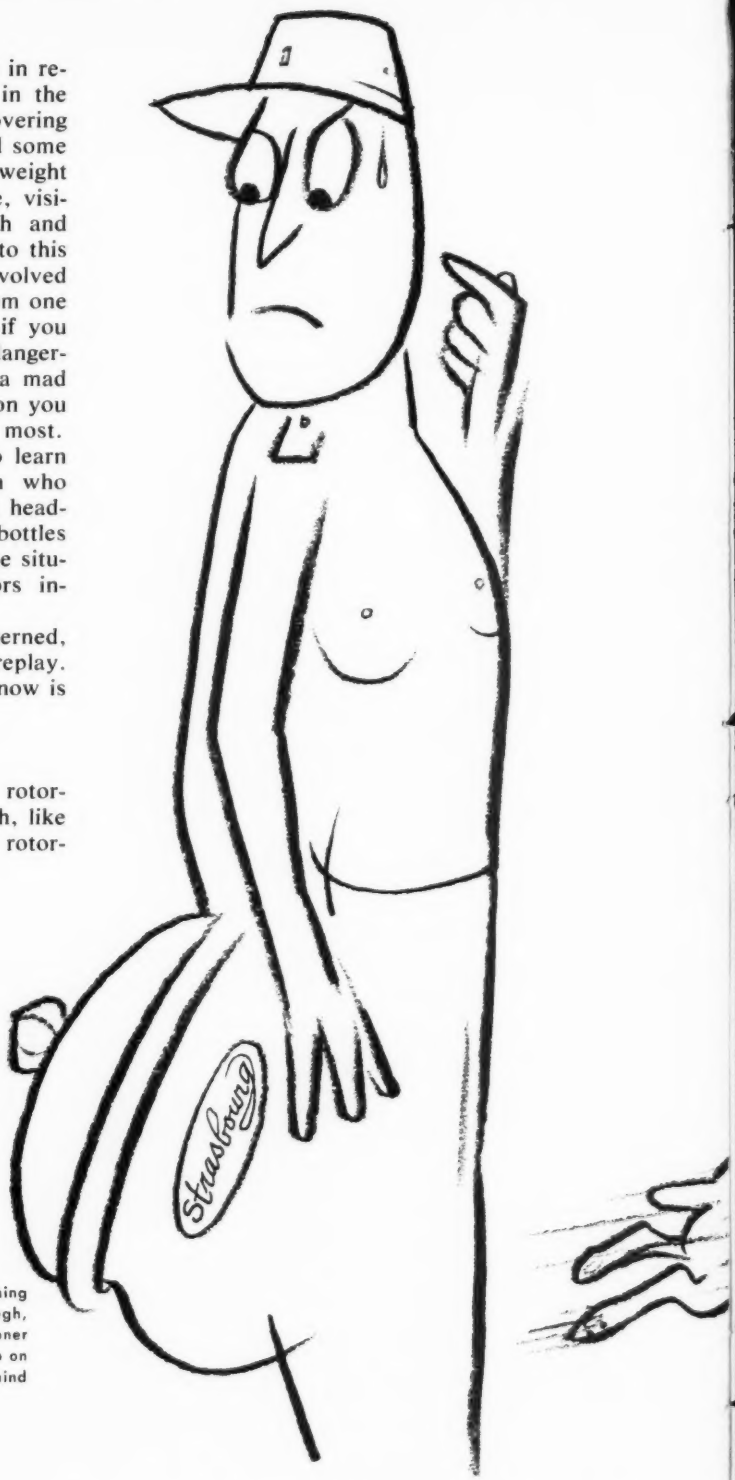
damaged or destroyed by tail boom strikes in revetments. And this doesn't begin to take in the number which have come to grief during hovering everywhere because pilots forgot or ignored some of the facts of life like pressure altitude, weight limitations, N_1 and N_2 factors, temperature, visibility, ground conditions, rotor downwash and blade tip vortices. If there is a bright side to this seamy story it is that at least the pilots involved sooner or later have had driven home to them one of life's even harsher facts, which is that if you keep on overlooking something potentially dangerous long enough, be it a calorie chart or a mad dog, sooner or later it is going to sneak up on you from behind and bite you where it hurts the most.

There is no real reason why we have to learn things the hard way. Any prudent man who doesn't relish the prospect of plummeting headfirst into a pitfall lined with broken beer bottles sensibly takes a hard professional look at the situation he is in, weighs the various factors involved, looks ahead and acts accordingly.

As far as hovering techniques are concerned, maybe we could all do with a little instant replay. As long as we have the rest of the day off, now is as good a time to start as any.

BLAST OFF

We'll begin our considerations with the rotorwash problem. A problem it is, too—though, like most problems, it needn't be. Trouble is, rotor-



If you keep overlooking something potentially dangerous long enough, be it a calorie chart or a mad dog, sooner or later it is going to sneak up on you from behind

wash is something you can't see as easily as you can spot a boil on the end of your nose. When something is as hard to detect as the Invisible Man, it is twice as easy to give it a miss.

One of the basic difficulties about rotorwash is that it is a two-way street. It can play hob with the chopper which hatched it. It can be equally as devastating to anything or anybody which gets within blowing-down distance.

People who have been around helicopters for any length of time don't need to be told it is a good idea to hang on to their hats if they are standing by when one is taking off or landing. What they may not appreciate is (1) how strong the downblast really is and (2) how far it and its deadly twin sister, blade tip vortices, can extend. A helicopter, even a small one sitting on the ground, is a fairly sturdy piece of machinery. Not the sort of thing you would think could be hurt by a mere puff of wind. True. Yet a hovering helicopter preparing for takeoff can depress the main rotor of an idling sister ship into the tail rotor with results you don't have to have a full color picture of.

A hovering helicopter near a runway can put a light fixed wing airplane trying to take off into the dirt as effectively as a Baltimore Colts defensive lineman clobbering an enemy quarterback. It doesn't have to be in the immediate vicinity to do the job, either. We've mentioned vortices. A rotor blade tip traveling around at about the speed of sound throws turbulent air in all directions off its tips with the same slingshot technique David used when he beaned Goliath. With just about the same effect. And greater range.

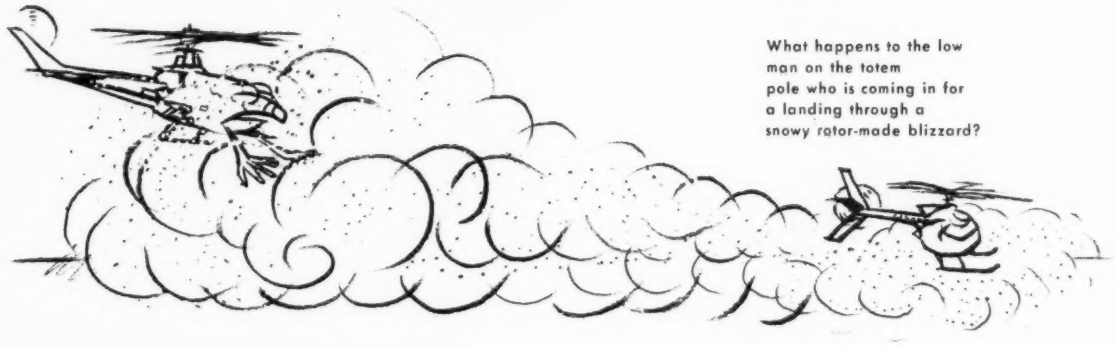
Ask a helicopter to carry a few pounds more than the union rules allow and it will let you down . . . hard

David was standing eyeball to eyeball with Goliath when he let him have it. A hovering helicopter *within 1,000 feet* of a runway can be even more deadly than a slingshot for a light aircraft trying to take off through the churned-up air. In case you are not much on arithmetic, that's just about the length of three football fields.

Once started, the vortices' effect has a way of lasting and lasting, another fact not always appreciated. A big jet can leave a trail of disturbed air in its wake for several miles. Pilots of following aircraft quite a time later can find the going rough indeed. So, when you take a nice mixture of rotorwash and vortices coming from a helicopter in a busy area where other helicopters and light aircraft are coming and going, you can have a potential which can boobytrap another man as effectively as a live handgrenade planted in the cockpit.

As for downwash, it can create more trouble for everybody than a baker's dozen of Peck's Bad

HOVER SENSE

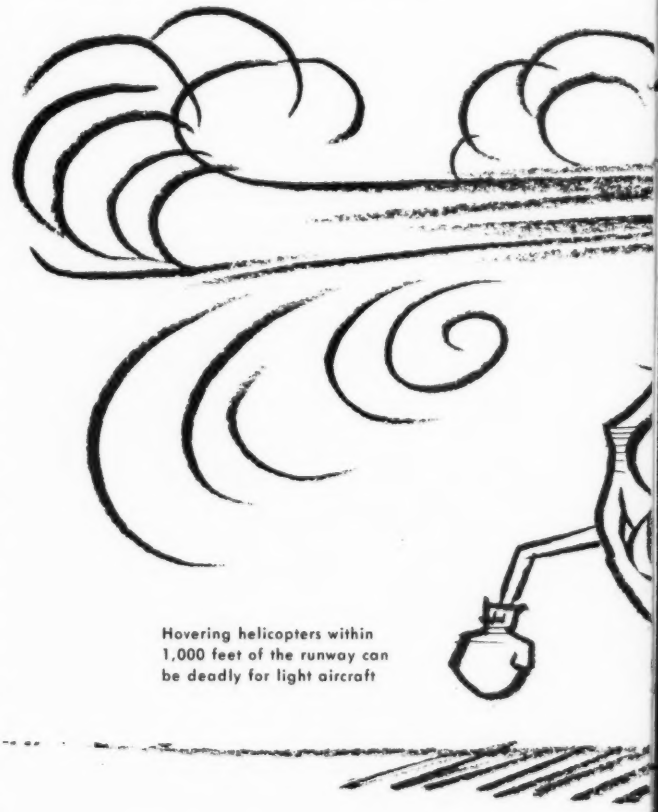


What happens to the low man on the totem pole who is coming in for a landing through a snowy rotor-made blizzard?

Boys. Another example we have all encountered to some degree—some to more degrees than they like to remember—is the matter of dust. One helicopter all by itself can stir up more dust than a whirlwind in the Mojave Desert. Six or more coming in for a landing at about the same time can brew a soup thick enough to stir with a ladle. So what happens to poor tail end Charlie who is trying to let down through this mess? Need you ask? Need we go on to mention that the same mill of thrills prevails in cold weather country for the low man on the totem pole who is coming in for a landing through a snowy rotor-made blizzard which would have caused Admiral Peary to give serious thought to trying to discover Miami Beach rather than the north pole?

Hovering over water can also create problems—distressing ones for unfortunate souls on the receiving end of rotorwash, at times. People on the inside of the movie industry will tell you those stirring storms-at-sea effects are actually created by a giant fan blowing across an indoor tank. A hovering helicopter can blow up a gale in a millpond on a sunny day with no surface wind. If you happen to be floundering around in the millpond, awaiting rescue, downwash and waves can shove you under as permanently as if some villainous chap had tied an anvil to your feet. Not long ago, the well-intentioned but misguided pilot of a Chinook attempted to rescue the crew of a ditched helicopter. By the time a boat arrived to make the pickup, several of the men in the water had drowned in the rough seas kicked up by the rotors. The crew of a ditched UH-1C in another instance was luckier. The boat made it to them on time, but only just in time. They were on the point of exhaustion from battling the waves and spray caused by a helicopter hovering overhead.

Dust, snow, water—okay so we've got problems in this area of the hovering picture. But not problems which can't be solved or at least cut down to handling size. As far as the dust and snow bit is concerned, it's a simple matter of con-

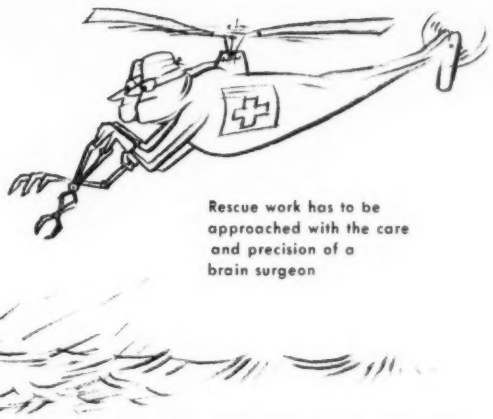


Hovering helicopters within 1,000 feet of the runway can be deadly for light aircraft

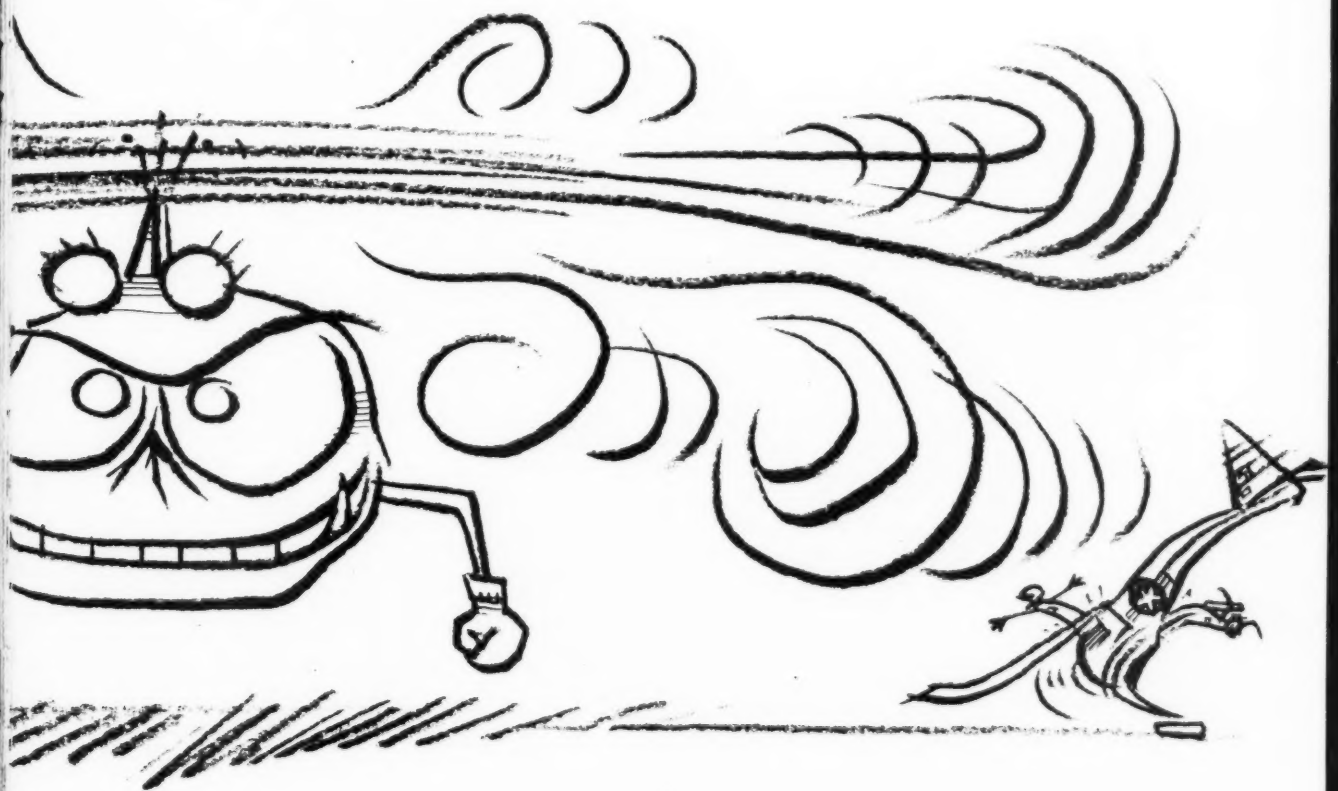
trolling impatience. Given only a bare amount of time, any dust or snowstorm will subside as the law of gravity takes over. A wise pilot in a helicopter will hold off coming in until the murk created by the man ahead of him has died down. Go ahead too soon and you are taking an unnecessary risk. There are enough necessary risks as it is.

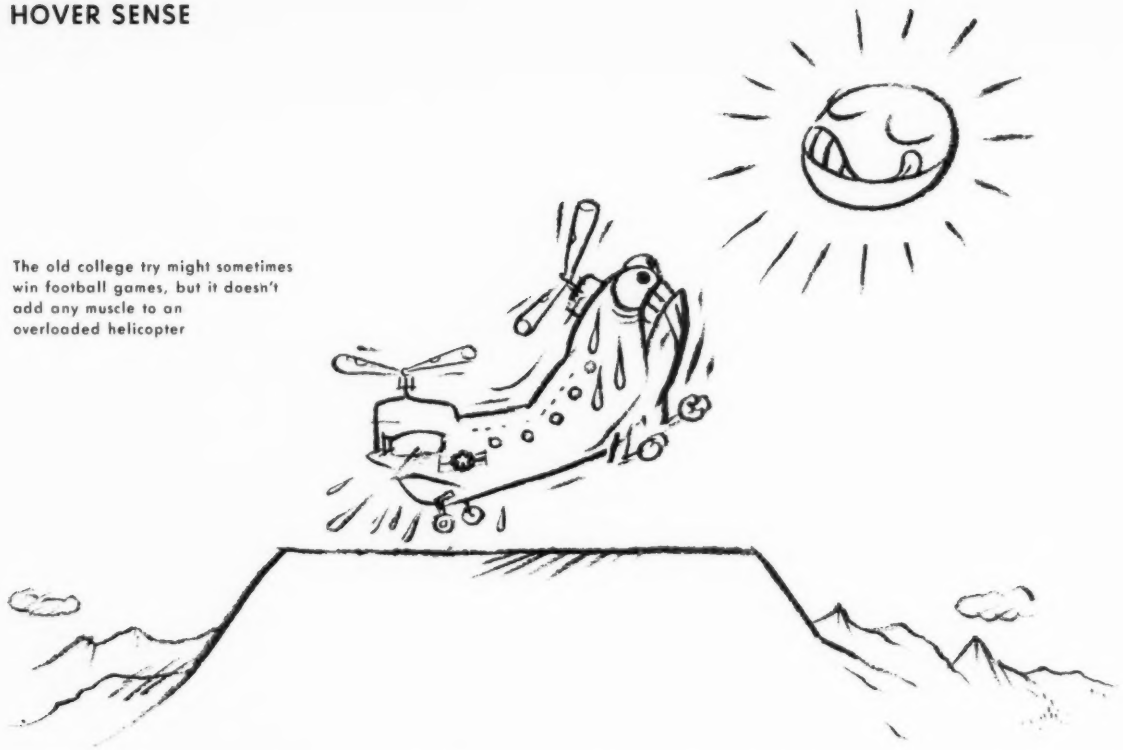
As for hovering pickups over water, it's really a job for an experienced and trained crew with proper equipment. The rest of us will be doing ditched airmen a favor by dropping them flotation gear and then staying within hailing distance until somebody arrives who can fish them out of the water.

Let's say for the sake of argument, though, there just isn't anybody else handy to do the job, and experienced or not, it falls on you to make the rescue. Your chances—and those of the people you are helping—will be considerably brightened if you remember to approach from downwind, maintain a high hover and avoid the natural inclination to go up and down with the water swells. Bear in mind, too, that the calmer the water, the more difficult hovering becomes. Glassy, calm water affects depth perception, particularly at night, so the task has to be approached with the care and precision a brain surgeon devotes to his work. Too much haste and



Rescue work has to be approached with the care and precision of a brain surgeon





The old college try might sometimes win football games, but it doesn't add any muscle to an overloaded helicopter

you'll wind up in the drink yourself. They say that misery loves company, but the airmen who are already down aren't likely to greet you with loud cries of welcome.

AND DAMN THE TORPEDOES

If too much haste can bring you down in over-water hovering, it can get you exactly nowhere in dry-land hovering just as easily. That, and a lack of attention to the absolute fixed limits imposed on a helicopter's performance by the load it is carrying, considering temperature and altitude. More than one aircraft has crashed during a hover because the pilot has bought the tired argument that he might as well give it the old college try. The old college try might sometimes win football games, but you can take it as gospel that it doesn't add any muscle to an overloaded helicopter trying to battle its way through thin or overheated air.

Here is one highly critical area in which even a well-educated guess is not educated enough—and guesses have a way of being a long country mile or so off target if they are made by a man under pressure who allows himself to be in too much of a hurry. Those various gauges and indicators and thingumajigs which clutter up the cockpit weren't put there by the manufacturer to confuse honest airmen and make their tasks more complicated. The N_1 and N_2 indicators, temperature gauges, go-no-go cards and the like were installed so pilots can have an exact idea of what their lifting capability is and how much margin they have. Again, this is something we all know—and, once again,

The basics can't be altered just because you're in a hurry or the situation gets hot

there's too much evidence adding to the dismal conclusion that people don't always use the tools they have in their hands to help them.

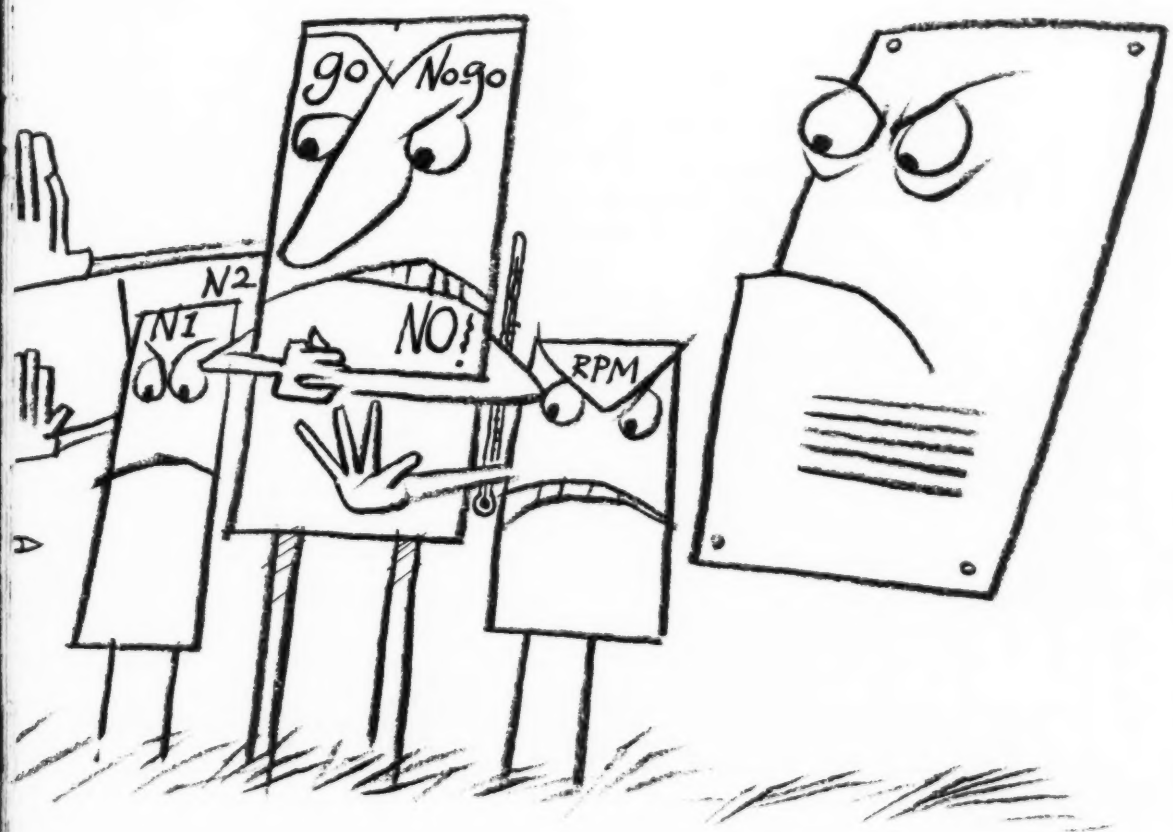
A too-typical example concerned a UH-1D pilot who tried to take off with six extra fairly hefty men with an outside air temperature of 33 degrees centigrade. A hover check showed they had approximately 94 percent power and if anybody had bothered to take a look at the go-no-go chart, it would have informed them loud and clear that a normal takeoff at that temperature was out of the question. As it was, the pilot might have made it if he had used all the runway available. He didn't and he totaled the aircraft in a prime case of a crash which had no excuse for taking place.

Hasty guesswork played a large part in another major accident, this one involving a UH-1C. In this case, the pilot involved checked his rpm while hovering, noted it had begun to bleed and wisely shut down. He took off a case of M-79 ammo to reduce the weight and tried again, this time with the confidence of an eagle diving on a

He might have made it, but . . .

pigeon. Too much confidence, in fact. The resulting investigation showed that taking off the case of ammunition was nothing more than, if you'll forgive the term, a crash diet. He was still overweight, as the accurate check called for would have told him.

It's a matter of basic truth that a 2-foot hover requires 2 percent more power than the placard shows to boost out of ground effect. (What the placard shows if it has been kept up to date to account for engine deterioration, and don't forget *that*, either.) The basics can't be altered just be-



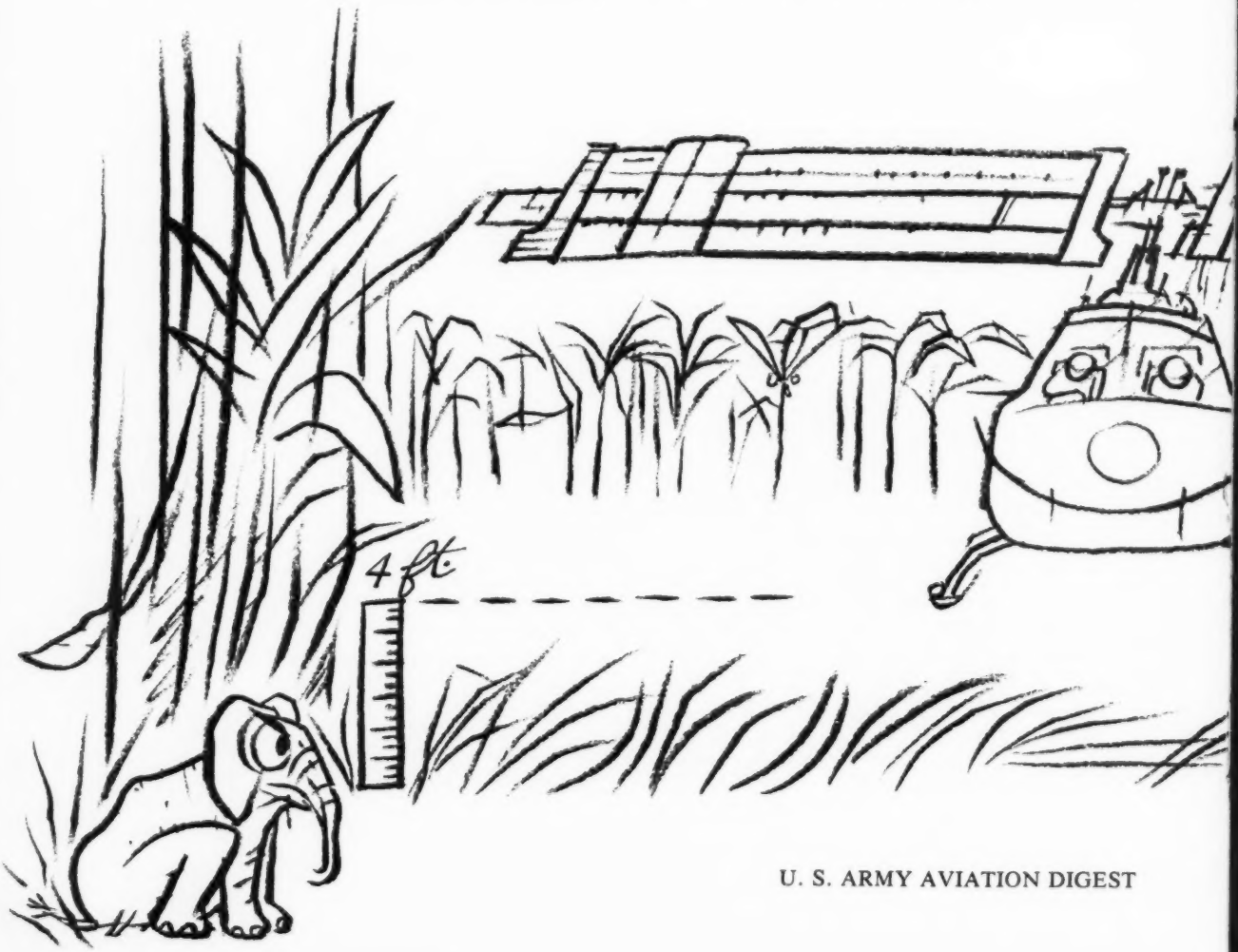
cause you are in a hurry or the situation you are in is hotter than the top of an old wood-burning kitchen stove.

There's no getting around the unhappy fact that basics are being ignored. Maybe it's the other way around. Maybe the real fact is that not every aviator knows as much about the basics as he thinks he does. Whatever the case, Huey takeoff accidents have accounted for a great many of the noncombat losses in Vietnam. A common explanation is, "The aircraft lost power on takeoff." Sure it did, but that doesn't tell the whole story.

For instance, practically everybody except the Red Cross girls and maybe some of the lesser stars who come to entertain the troops knows that a confined area takeoff demands more power. It seems possible not all of us appreciate the finer points. Let's say you are trying to take off from a confined area with the standard 2 percent N_1. You will pull off a considerable amount of N_2 during takeoff, which means you won't take off. You might make it with a running takeoff and a fair headwind, but in a confined area it is strictly no-go and all the enthusiasm and college trying in the world isn't going to alter matters.

Well, how *do* you get off? You can't just leave the poor old Huey sitting there until the jungle grows over it. Again, as everybody knows and this time probably even the Red Cross girls could come up with a solution, the answer is to reduce the load. But here's the catch. How many people know *exactly* how much weight to take off to make the Huey airworthy? That one-fourth of one percent N_1 is enough to lift 100 pounds and that if you want an additional 2 percent and happen to have an 800-pound baby elephant aboard, it would be a wise idea to unload him? Taking off a case of ammo sure isn't going to help any, as the hapless pilot of the UH-1C discovered.

There are a few other tricks to the trade wise old pros know and will be happy to share with



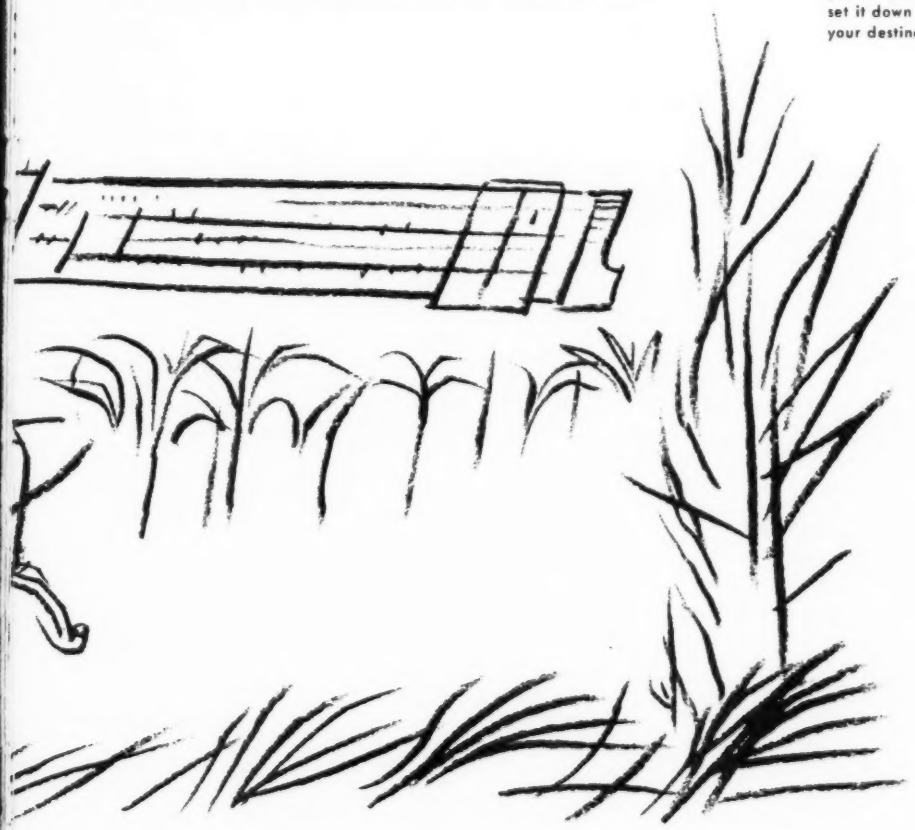
you. They will tell you that:

- If 2 percent N_1 reserve power is required for a normal takeoff, confined areas demand three.
- Tall grass *or* a 4-foot hover requires tacking on three-fourths more. Both grass *and* a 4-foot hover add up to 1½ percent.
- Out of ground effect means you have to have 3½ percent reserve over a 2-foot hover.
- A 3-knot tailwind takes 1 percent more at a 2-foot hover.

What the old pros have learned from all this is that when you are hovering you have just about as much flexibility as the Washington Monument. If you know and stay within set limits you are safe as rain. Go a step too far and you may live to fly again, but probably not in the same helicopter.

As long as we are in the neighborhood, let's make a special note of that bit about tall grass. It's a good idea never to forget on takeoff what you are likely to encounter at the other end of the

Having ample reserve power for a successful takeoff from an improved area doesn't mean you have enough if you have to hover and set it down in a patch of buffalo grass at your destination



If you want an additional two percent N_1, taking off a case of ammo isn't going to help. Unloading the 800-pound baby elephant would be a wise idea

Most of us like to think the worst won't happen, which is why it does happen more than it should . . .

line. Having ample reserve power for a successful takeoff when you start out from an improved area doesn't mean you will have enough if you have to hover and set down in a patch of buffalo grass at your destination—and the 4-foot hover you are likely to need isn't going to help matters. Since in the field there will be times you will no more be able to tell what the future holds than a near-sighted crystal gazer, the name of the game is to assume the worst.

ETERNAL OPTIMIST

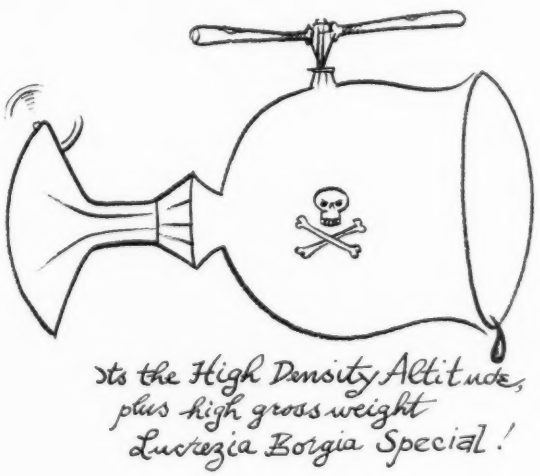
That's a big part of the hang-up—most of us like to think the worst won't happen which, naturally, is why it *does* happen more than it should. It helps account for the overload problem, particularly when temperatures and pressure altitude are on the rise, which has been bringing down hovering helicopters like so many clay pigeons.

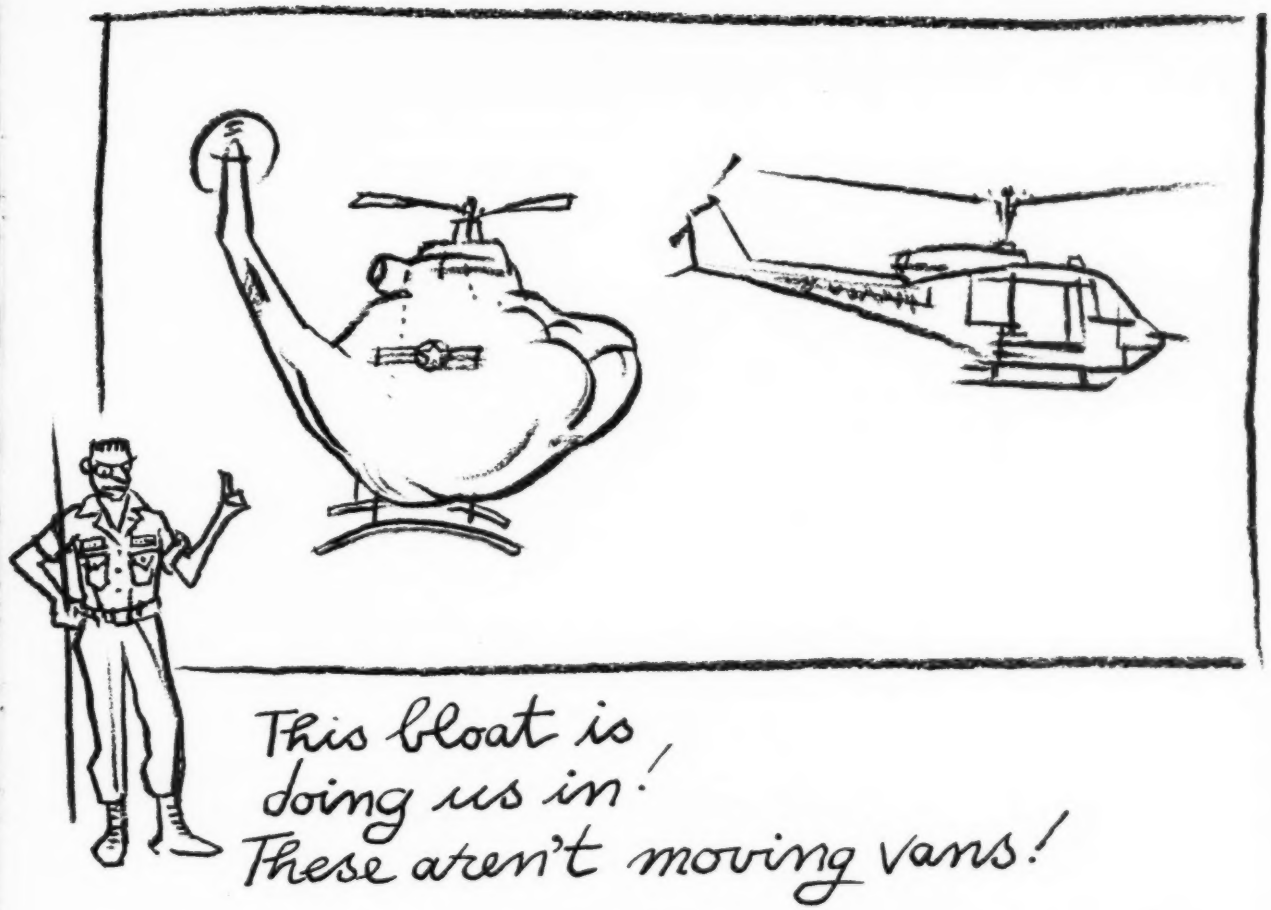
High density altitude conditions, plus high gross weight, can be just about as lethal as those jiggers of cyanide Lucrezia Borgia used to slip into her dinner guests' wine goblets. Few of them lasted much past the salad course. Not even Lushwell McToper, the town drunk, will risk downing a cyanide cocktail, much less Army pilots. There is strong evidence that some pilots will take a chance on operating with an overload when the thermometer is rising like an express elevator. That's not really risking anything. It's inviting a certainty. A dead certainty, sometimes.

There were two recent UH-1B gunship crashes, almost identical in nature, which bear this out. Neither pilot had performed the power check called for. They both crashed from a 15-foot hover, both had rpm beeped to maximum, only to have it fade, both were loaded to the hilt with two gunners, weapons and all the rest and both were operating in high temperatures.

The pilots really knew when it came down to the bone that they were asking for trouble. What got in their way was the too-widely-held and fuzzy theory that combat and pressures of operating in the field call for extra risks to be taken. There's something to this, too, under certain circumstances, but *never when you are fooling with the laws of physics.* You might as well risk jumping off the Golden Gate Bridge with nothing but a paper parasol to hold you up to save somebody who is drowning.

The list of crashes caused by overloads—and if you piled all the accident reports on the subject on top of each other you'd have an impressive monument to man's unerring ability to make a bad guess—is depressing evidence that too many people have bought the high risk theory that in combat you have to "accept" more accidents than you would normally tolerate. This kind of reasoning belongs in books like Alice in Wonderland. The fact that the enemy persists in taking pot shots at our helicopters is a clear indication that they would prefer to have them in something less than good flying condition. We save the little





men on the other side a lot of trouble and ammunition if we obligingly crash them ourselves.

Drastic illnesses sometimes require drastic remedies. One unit which had had more than its fair share of hover accidents in a short span of time did just that. It set up a system of periodic inspections to remove excess weight, the kind of housekeeping bric-a-brac which can creep aboard a helicopter like the junk which accumulates in hall closets.

Basic loads for gunships were cut to the bare minimum and only essentials were left aboard, with personal effects the first to go, regardless of the length of the mission. When moving the unit, lift ships made two trips to carry excess baggage instead of being packed like a van carrying the furniture from a 10-room house and gunships were given half ammo.

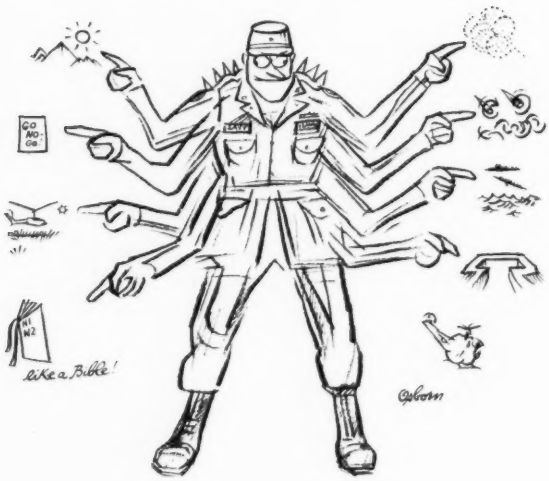
Classes in operating with loads were conducted. New personnel were given special red-carpet treatment on the fine points of hovering. Go-no-go placards were installed and kept up to date to account for engine deterioration. The unit didn't exactly hold pep rallies and torchlight parades on the subject, but all hands had driven home emphatically the inflexible rule that (1) no aircraft should be overloaded for prevailing temperatures and altitude and (2) if through some mischance, the rpm began to bleed during hover, the pilot was to abort the takeoff.

The unit is now just about as free from hover crashes as Louisiana is of yellow fever.
P(Hover).D.

Golfers will tell you that anybody can look like a Masters champion when he is belting the ball off the tees or down the fairway. The real drudgery comes on the greens, in those last few feet from the cup which separate the men from the boys and where championships are really decided. The pictures you see on the sports page of happy golf-

HOVER SENSE

He never forgets a few other tricks to the hovering trade, tricks which put him in the upper brackets when it comes to flying ability



ers being awarded big fat checks are of chaps who have studied and mastered the fine art of putting and spent as much time and more on the greens than they have on the practice tee.

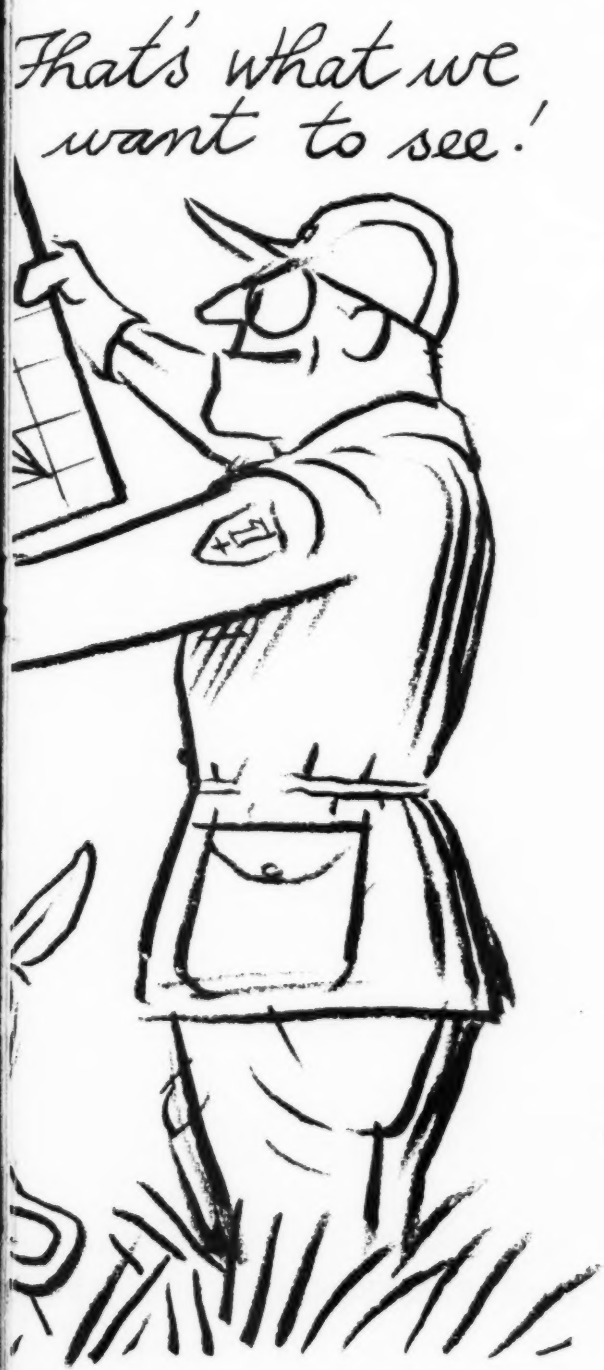
You can draw a nice comparison between putting and hovering an Army helicopter. Piloting one is no easy exercise, even when you are sailing along at a healthy altitude with nothing but a flock of crows to bother you. The hover is something else again and the Masters champion at it is the pilot who has given it the same devoted attention the pro does his trusty putter.

That means complete attention to details, complete concentration and complete respect for the limits beyond which a helicopter can't perform successfully, any more than if you had lashed it with chains to Plymouth Rock.

A pilot with this healthy attitude keeps within the bounds imposed by temperature and altitude, to be sure. This is no more than the sort of fundamental nuts and bolts of aviation the Army has a right to expect—even if it doesn't always get it—of every trained airman. Our friend goes further. He never forgets a few other tricks to the hovering trade, tricks which put him squarely in the upper brackets when it comes to flying ability. For instance?

He is well aware that a helicopter which hovers for over a minute can set up a flow of exhaust gases which raises intake temperatures by as much as 10 degrees and causes a drop of up to 50 horsepower and a corresponding drop in lift capability.

He keeps in mind that the last man in a formation does well to hold off on landing until the gases and turbulence have a chance to dissipate.



If it is his turn to ride shotgun he reduces his weight to compensate.

He never forgets that hover conditions where he is going to aren't always the same as they are where he starts the day from, depending on altitude and temperature. What will get you off the ground may not be what you will need when you arrive at your destination.

He knows the N_1 and N_2 facts of life the way a preacher knows the Good Book.

He avoids the problem of manmade blizzards by the simple trick of not flying in marginal weather unless he has to and he has a CO and safety officer who will back him to the hilt.

He waits for dust clouds caused by others to die down before he lands and, when he is taking off from a dusty surface, he does without a hover if at all possible. Among other things, he has seen what dust and sand can do to a turbine's innards.

He is always conscious that he is riding a whirlwind and that the vortices and downwash he is creating can spell big trouble for some hapless fellow pilot.

He knows all there is to know about the effect of surfaces—improved, high grass and water—and he has boned up on how to land and take off on slopes.

He is careful around revetments and in confined spaces and, when there aren't any groundguides, he makes sure every member of the crew helps feed him the last-second information on anything which could get in the way.

He makes sure his go-no-go card is as fresh as this morning's milk.

A thorough soul. Even a bit picky some people might say. But a solid citizen just the same. He gets the job done *when it can be done and only when.* One thing you can count on along with such accepted facts as the sun coming up in the east.

You will never find him sitting at the controls of a smashed helicopter, wondering why those last two pesky feet were so danged hard.

Ted Kontos

In all probability, readers will note some disparity between the first portion of this and facts documented by aviation historians. This is due to the use of reference material not recognized by historians. In all probability, it will not be recognized by them in the future

MASTER OF THE SKY?

FOLLOWING HIS evolution, man looked toward the sky for centuries. He studied the sun, the moon and the stars and wondered about them. He looked with awe at gulls swooping down to snatch their dinner from the sea. He gazed in admiration at formations of migrating geese and watched eagles soar to impossible heights. The challenge of flight proved too great for him to ignore. He decided he would not only fly, but surpass the best performance of these winged vertebrates.

Having made his decision, man set his superior brain and skill to work. Logically, he reasoned that the prime anatomical difference between himself and birds was that birds came equipped with wings instead of arms. With his versatile hands, he reasoned that he could readily fashion wings, as well as manipulate them in a bird-like manner. Proceeding to do just that, he put together a magnificent spread of wings, strapped them to his arms and climbed to the edge of a precipice. Shouting triumphantly, he leaped into the air, flailing his winged arms. He flailed and flailed and flailed—all the way down, his triumphant shout changing to resemble the blast of a disillusioned bull elephant caught in a hunter's trap. His reverberating scream ended with an earth-shaking thud.

Undaunted by this setback, man would not be disuaded. He put his logic back to work to determine the cause of his failure and, in a short time, he had his answer. Wings alone would not produce flight. A bird's wings were made of feathers. Surely, man, in his wisdom, should have realized that, for wings to function properly, they must be made of feathers. Armed with this new knowledge, and feathers reluctantly donated by chickens, he fashioned another pair of wings more magnificent than the first. He strapped them to his arms, climbed to the edge of the precipice and gazed down upon the debris of his first flight at-

Recognizing his inherent weaknesses, man has devised means of protecting himself. These means are simple enough so he can readily abide by them. But he doesn't. He has accidents and mishaps from the same causes, year after year

tempt. Again, he launched himself into the air and flailed his winged arms. Alas, his efforts were once more rewarded with an earth-shaking thud.

Tenacious man nursed his bruised ego, as well as other parts, and determined additional research was in order. At length, his perseverance paid off and he developed a heavier-than-air machine that could fly—sometimes. It belched forth smoke and flame and made a thunderous roar as it weaved and bobbed erratically with the grace of a charging rhinoceros. It must have appeared as a formidable threat to the birds. In time, however, they decided the winged monster posed no immediate threat to their personal safety and reluctantly accepted it.

During the following years, man made tremendous strides in aviation. He developed the parachute to save himself when his machine developed an unreasonable hunger for the ground. In his haste, he forgot the lessons he learned from his first flight attempts and limped away from the first test of this new creation. By now, it was clear the airplane was here to stay.

Many immortal greats emerged to publicize and promote aviation. Among these was the daredevil, Baron Von Sonly, who, after performing a hair-raising routine, climaxed his act with a cloverleaf at nearground level. Although able to give only one performance, it was a spectacular one.

Another great was Daring Dan Devine, whose barnstorming antics made castor oil and liver pills unnecessary for every man, woman and child in range of his stunts, and earned him the nickname "Doc"—a name that stuck with him throughout his aviation career—nearly 6 months.

This was the period of daring young aviators. There were no old ones around. It was also the period of highly versatile but questionable aircraft. These machines, many designed by the pilots who flew them, could be made to perform inverted flight, loops, rolls, spins and other equally wild maneuvers. Unfortunately, they sometimes performed these when the pilots intended to fly straight and level. Coupled with noseovers and groundloops, these antics provided sensational thrills for occupants and spectators.

As more and more aircraft came into existence, man began to realize their commercial possibilities. He designed the passenger plane and developed the ability to carry large groups of people to their destinations in record time. While their arrivals were not always at intended destinations, they got there a lot faster.

As the ranges and carrying capacities of aircraft grew, new obstacles to flight began to appear. The weather didn't always cooperate, causing flights to be cancelled or delayed. Winds would often blow aircraft off course, resulting in depleted fuel supplies. Occasionally, a mountain would appear in front of an offcourse aircraft, causing varying degrees of concern, up to and including sheer panic, among crews and passengers. Man tackled these new obstacles with the same fervor he had previously displayed. He designed more and better instruments, improved communication and navigation equipment, built more airfields along scheduled routes and developed instrument landing systems. He went on to surpass nature's winged creatures. He learned to pressurize cabins so he could fly at previously uninhabitable alti-

tudes. This gave him a new freedom to climb above and avoid the worst weather. It also gave Herman, the curious navigator, a terrific headache when he unlatched his astrodome at 40,000 feet.

Man persisted in his quest to conquer the atmosphere. He developed the jet engine and, with it, the ejection seat which, in the early days, often proved more reliable than his jet engine. He broke all existing records, climbing higher than ever before. He broke the sound barrier and raced the sun across continents and seas.

Though filled with pride at his past accomplishments, man had matured and he looked upon the natural inhabitants of the air with a new respect. Despite their inadequacy to compete with him in speeds and altitudes, he found they were endowed with special qualities not inherent to man. He could not recall a bird attempting flight while sick or hurt, except in an emergency, and then only far enough to reach safety. Nor had he ever heard a Mayday call from a wild goose which was lost and running out of fuel, or in trouble because it was inadvertently caught in weather. Nor had he heard of any bird experiencing structural failure from self-induced g loads. He had never seen a bird falter and crash because it attempted flight while overloaded or out of c.g. With skies filled with birds of all varieties and sizes, flying alone or in flocks of hundreds, none tumbled to the ground from midair collisions.

Man learned that a sparrow doesn't try to compete with an eagle for altitude, an albatross for distance, a hawk for speed or a hummingbird for maneuverability. Within the confines of each bird's narrow skull lies a pea-sized computer which performs the same functions for its host that operations personnel, dispatchers, meteorologists, navigation and communication specialists, refuelers, mechanics, flight surgeons and all other supporting personnel perform for manned flight. A bird is always aware of its capabilities and limitations, and its computer never permits it to exceed them.

With a total lack of natural abilities for flight, man yet remains the fortunate one. He is not programmed to only perform certain specific functions. He has the ability and freedom to accomplish any aim. In this respect, his specialized brain allows him to operate in an environment foreign to him and to surpass the creatures native to this environment. He has surpassed them in all respects except mishap prevention.

Looking back at his accident experience, man realized his fallibility. More important, he admitted it. Despite his superiority, he is subject to errors in reasoning and performance. Since he depends on others, man compounds the possibility of human error over and over. A pilot, for example, cannot rely only on his own knowledge and skill. He must also depend on mechanics, meteorologists, control tower operators, airfield maintenance personnel, etc., all the way back to the designers and manufacturers of the equipment he uses. This chain is endless and any defect in materiel or workmanship, any error in judgment in any link of the chain, can cause a mishap.

Recognizing his inherent weaknesses, man has devised means of protecting himself. These means are simple enough so he can readily abide by them. But he doesn't. He has accidents and other mishaps from the same causes, year after year. How many have resulted from failure to torque aircraft hardware properly, failure to safety hardware, improper or omitted inspections, violation of regulations, etc.? All are repetitions of previous mishaps and they continue to occur to this day.

When we read about mishaps, many of us shrug our shoulders and say, "That couldn't happen to me." The sad fact is that it can happen to any of us. Recently, an IP with more than 28 years of flying experience and 18,000 flying hours and a master Army aviator with more than 4,000 flying hours attempted a takeoff with an external control lock on the left elevator. The airplane crashed and burned, killing all three occupants.

Could a *thorough* preflight, followed by *complete* cockpit checks, using approved checklists, have prevented this accident? You be the judge. *It couldn't happen to you?* Balance your experience against the experience of these pilots and remember, it *did* happen to them.

The solution to most mishaps is extremely simple. Though hackneyed with repetition, it is still valid and effective: FOLLOWING BY-THE-BOOK PROCEDURES IN ALL AREAS BY ALL AVIATION PERSONNEL, COUPLED WITH STRINGENT SUPERVISION TO ENSURE THIS COMPLIANCE.

When man decides to take mishap prevention seriously, he can stop most accidents. Then he can stand on his precipice, erect with head held high, and truly say, "I am master of the sky!"

CHAPTER 4

ARMY AIRCRAFT ACCIDENTS

4–1. Investigation of Army aircraft accidents. *a. Policy.* Reports of Army aircraft accidents investigations and all information contained therein will be considered "privileged" in accordance with AR 95–30 and will be handled as prescribed in paragraph 1–4. Collateral investigations of aircraft accidents will be conducted as provided in paragraph 4–5. One of the purposes of a collateral investigation is to provide factual information that may be released outside the Department of Defense to persons directly concerned. Such release may be made upon the approval of The Judge Advocate General.

b. Responsibility.

(1) The commander first becoming cognizant of an Army aircraft accident will—

(*a*) Place a guard at the scene of an accident to prevent moving or disturbing the aircraft, until released by the President of the accident investigation board, and USABAAR (if participating).

(*b*) Notify the proper authorities to include the installation of departure, destination, and home station(s) of the aircraft and operator.

(*c*) Submit a Crash Facts Message in accordance with paragraph 4–2.

(2) After notification of an aircraft accident as outlined in paragraph 3–2, the aircraft operator's commander or supervisor will be responsible for initiating action for the investigation and reporting of the accident. If, for reasons of remoteness or lack of qualified personnel, a commander cannot adequately conduct such an investigation, he will request assistance from the next higher headquarters.

(3) When two or more Army aircraft are involved in the same accident and the operators are from different organizations, the organization deemed responsible will have investigative responsibility. Only one aircraft accident investigation report will be submitted.

(4) A command responsible for a ferry flight is also responsible for investigation of an accident occurring during that flight. Authority to request assistance of the major headquarters of the geographic area in which the accident occurred is hereby granted.

4–2. Aircraft Crash Facts Message, RCS CSGPA–459(*) *a. General.* Any unit or military installation commander becoming cognizant of an Army aircraft accident or mishap, as defined in paragraph 2–1 and section II, chapter 2, will submit an electrically transmitted message by available military communications normally within the next 8 duty hours or sooner when warranted by severity of loss, possible design weakness, maintenance or operational failure. The message will be accorded precedence as defined in AR 105–31, and will contain as much of the information required by *e* below as is immediately available. When complete information is not furnished in the initial messages, it will be followed by a supplemental message within 5 working days referencing the original message, including date of the event, aircraft type and serial number, and containing all additional information. If military electronic communication facilities are not available, use of commercial facilities is authorized to report only date, time, place of accident, type model, serial number, damage, number of fatalities, and number of injuries. Names of persons and probable causes will not be included. In this case the report will be completed as required, but will be airmailed to each agency that requires the report. Initial and supplemental messages will be forwarded to the addressees listed in *b* and *c* below.

ARMY AIRCRAFT MISHAP REPORTING

Louis H. McKenzie
Data Center, USABAAR

PARAGRAPH 4-2a, AR 385-40, dated October 1969, states: "Any unit or military installation commander becoming cognizant of an Army aircraft accident or mishap . . . will submit an electrically transmitted message by available military communications normally within the next 8 duty hours or sooner when warranted by severity of loss, possible design weakness, maintenance or operational failure. . ." When an accident is reported by crash facts message, it is transmitted to the addressees listed in paragraph 4-2b of AR 385-40. Messages pertaining to incidents, forced landings and precautionary landings will be dispatched to the addressees listed in paragraph 4-2c of this regulation.

Paragraph 4-2e, Change 2, AR 385-40, dated 24 November 1970, and paragraph 14-1, Change 2, AR 95-5, dated 10 November 1970, prescribe the content and format for crash facts messages. When crash facts messages are received, USABAAR analyzes, codes and inserts the reported data into its aircraft accident prevention data bank. Unfortunately, many messages cannot be processed this way because of errors. These include:

1. Incorrect aircraft types, models, series and serial numbers. All serial numbers are verified with USAAVSCOM listings. An example of an obvious error is a message pertaining to an AH-1G and listing its serial number as 64-12345. The serial numbers of the first AH-1Gs delivered to the Army start with 66.

2. Incorrect classifications. Some major accidents are reported as "other" and incidents are reported as forced landings. In addition, estimated dollar damages are left out of incident messages.

3. Errors in personnel data. The most frequent errors in paragraphs 6, 7 and 8 involve DACs. When a DAC is listed as a crew member or passenger, his grade (i.e., GS-12) should be included.

4. Errors in the maintenance and materiel factors required by paragraphs 13 and 14. The most frequent of these include listing suspect items without followup substantiating data, and failure to include serial numbers, part numbers, and federal stock numbers.

5. Failure to report whether crashworthy fuel systems are installed, as required by paragraph 16d. Army aircraft are presently being equipped with these systems and it is very important to determine if they are preventing fires in survivable accidents.

Damage classification, paragraph 4-2e(5), AR 385-40, and paragraph 14b(5), Change 2, AR 95-5, should be more appropriately titled *mishap* classification. When speaking of damage, most people refer to *dollar* damage. *Dollar* damage does not have anything to do with whether a mishap is a major accident or an incident. The criteria used to determine mishap classification is simple, provided AR 385-40 is used correctly. The following guidelines can be used to quickly determine what type mishap has occurred:

1. Was there an intent to fly? Intent to fly is present whenever starting procedures are initiated and remains present until the engine, propeller(s) or rotors are stopped, except when maintenance procedures require starting the aircraft. If the maintenance procedures require bringing a helicopter to a hover, the intent to fly is present. Following are some examples when an intent to fly is present:

A helicopter returns from a flight with radio problems. The pilot hovers to the maintenance area and remains 10 minutes. As the radio repairman is working on the radio, his belt accidentally pulls the collective, causing the helicopter to become airborne and crash. The flight may have ended 5 minutes after the helicopter was on the ground (paragraph 2-8g, AR 385-40), but the engine and blades had not stopped (paragraph 2-8a,

MISHAP REPORTING

AR 385-40). The paragraph defining flight was not intended to influence mishap classification, but to define flight time for DA Form 2408-12 and DA Form 2408-13 data.

A T-41B pilot files a flight plan and is taxiing out for takeoff. The tower advises a squall line is approaching the field. The pilot replies, "Cancel my flight plan," and proceeds to taxi back to the tiedown area. Before he can shut down, the wind causes the airplane to flip over. Again, from the time the engine was started until the propeller stopped, the intent to fly was present.

Following is an example of a mishap involving no intent to fly: After performing maintenance, a crew chief is instructed to taxi to the parking area. En route, he taxies over a fire bottle and breaks the tail wheel spring. This is not an aircraft accident or incident, but an "other" type mishap (paragraph 2-15b, AR 385-40). It should be reported by crash facts message, investigated and reported on DA Form 285.

2. For mishap classification, it must be determined whether a major component was destroyed or damaged beyond economical repair. Examples of major components are wing panels, wing center sections, fuselages, vertical stabilizers, horizontal stabilizers, landing gear, strut assemblies, main rotor heads, tail booms and empennages. Engines and transmissions are not considered major components for mishap classification.

3. How many estimated man-hours are required to repair damaged aircraft? Tables 2-1 and 2-2, AR 385-40, list the man-hour requirements for mishap classification for the various categories of Army aircraft.

These three factors—intent to fly, major component destroyed or damaged and man-hours for repair—must be used to determine mishap classification. The following chart may help in determining classification:

Check those which apply:	YES	NO
1. Was damage incurred?		
2. Was there intent for flight?		
3. Was a major component destroyed/damaged?		
4. Were the man-hours to repair equal or greater than table 2-1?		
5. Were the man-hours to repair less than table 2-1 but greater than table 2-2?		
6. Were the man-hours to repair less than table 2-2?		
7. Was a landing made because further flight was not advisable?	YES	NO
8. Was a landing made because further flight was impossible?		

If YES to questions:	Classification is:
1, 2, 3	Major
1, 2, 4	Major
1, 2, 5	Minor
1, 2, 6	Incident
2, 7	Precautionary landing
2, 8	Forced landing
If NO to question:	Classification is:
2	Other

Aircraft mishap data contains the most essential facts used in preventing accidents. AR 15-76 charges USABAAR with the mission of conducting research of worldwide aviation accidents and related experiences to determine where improvements can be made in aviation materiel, operations, supervision, personnel and training. Based on this research, USABAAR will recommend appropriate action to enhance the durability, reliability and efficiency of Army aviation, particularly in its combat environment, to the Assistant Chief of Staff for Force Development.

USABAAR receives all Army aircraft accident reports. These reports are reviewed, analyzed and inserted into the accident prevention data bank. Continuous research is conducted to accomplish the USABAAR mission. Accident reports usually do not arrive at USABAAR until one, two, and sometimes as much as six months after accidents. This often delays identification of problem areas which, if identified earlier, might prevent other accidents, saving lives and preserving combat resources.

Crash facts message data can be used to establish an early warning system for accident prevention. When a mishap occurs, units must comply with AR 385-40 and AR 95-5 by:

1. Dispatching the crash facts message early.
2. Classifying the mishap correctly.
3. Checking and crosschecking data contained in the message (aircraft serial number; pilot's name, grade and SSAN; FSNs; P/Ns; EIR numbers; and a brief accurate description of how the mishap took place).

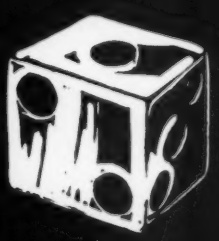
Clarification of regulations concerning aircraft mishaps and mishap reporting will be provided by the Director, USABAAR, Fort Rucker, Alabama, reference paragraph 6, AR 15-76.

VIOLATORS GAMBLE AND LOSE

ARMY AVIATION accident files contain many case histories of accidents caused by errors in judgment and violations of sound flying principles—a human trait which has plagued us since manned flight began:

10 May 1911: "From the evidence given the board finds that Lt. Kelly had made a flight of approximately 5 minutes duration, in a Curtiss bi-plane, at about 7 a. m., under good atmospheric conditions. As a result of this flight he met his death.

"He had made not a normally hard landing.



VIOLATORS GAMBLE AND LOSE

Upon landing, at least one and possibly both sides of seat fork were broken at a point between pilot seat and foot rest. At the same time it appears that one diagonal bamboo brace from front wheel to front elevator was broken, and its mate was bent.

"After striking the ground the first time, the machine bounded to a height approximating 10 feet, and gradually rising to about 30 feet until, within about 75 yards of the camp of the Eleventh Infantry, it made a sharp turn to the left, banked up with the turning wing, and made an abrupt dive to the ground. Lt. Kelly was thrown clear of the machine to a distance of about 20 feet.

"As a result of the first impact with the earth, it is apparent that the pilot lost control of the front elevator and therefore had only partial control of the machine.

"From all of the preceding facts the board is of the unanimous opinion that the accident was due to the efforts of Lt. Kelly to avoid endangering the occupants of the Eleventh Infantry camp in which endeavor it became necessary for him to make a sharp left turn, which, in the crippled condition of the machine, put more strain on the controls than would have been required in a straightaway landing. Such straightaway landing was impracticable owing to the proximity of the tents.

"Probable cause of accident: Error in judgment on part of pilot in selecting an unsuitable place."

You might think this human trait only snares young and inexperienced aviators. If so, you're wrong, dead wrong! Highly experienced aviators are also trapped by errors in judgment and violations of sound flying principles, as evidenced by the following five major accident briefs. The pilots involved in these accidents cover the spectrum of experience, from high to low.

A UH-1 IP lowered collective and rolled off power to begin a simulated forced landing at 400-700 feet and 80 knots. The helicopter hit the trees and ground in a nose-low attitude, bounced, rolled and landed on the masthead. The fuselage separated from the mast and transmission, coming to rest upright. The IP sustained major injuries and the two other occupants aboard had minor injuries. This accident was caused by the IP's violation of published directives. He made a simulated forced landing to an unauthorized area, then used faulty technique to recover.

A UH-1 aircraft commander decreased rpm to 6000 and autorotated to make a rapid descent from 3,000 feet to below traffic pattern altitude. His rpm exceeded high-side limitations during the descent. He had difficulty controlling rotor and engine rpm and his engine rpm fluctuated from 6000 to 4200. He could not recover from the autorotation and the helicopter struck the water in a nose-low attitude 75 yards from shore at approximately 30 knots and sank. Three of the 12 passengers aboard were killed, the pilot sustained major injuries and the crew chief, gunner and two passengers had minor injuries.

This major accident was caused by decreasing rpm prior to entering autorotation and autorotating at 90 knots. When the low rpm warning light came on during the recovery attempt, the aircraft commander applied collective, causing the rpm to further decrease, and turned right, attempting to reach the beach area. He did not decelerate or slow his forward speed before hitting the water. He also failed to roll the throttle to the full "on" position during his attempted recovery. When he tried to increase engine rpm with the increase/decrease switch, the engine fuel control was not affected.

This aircraft commander autorotated to lose altitude when a normal descent could have been performed. Autorotations with passengers on board violate paragraph 1-13, AR 95-1. Also, the number of occupants exceeded the number of seatbelts, a violation of command regulations, and flotation gear was not available.

A UH-1 pilot lost orientation while in trail formation and his helicopter crashed into trees after he entered a heavy rainshower at night. This accident resulted from restricted visibility, turbulence and darkness. The flight commander elected to fly after dark in marginal forecast conditions, violating his instructions, and led his flight of eight helicopters into IFR conditions when he was the only pilot in the flight with a standard rotary wing instrument ticket.

Another UH-1 pilot was unable to regain power after a test flight autorotation and continued to the ground, landing hard. The helicopter rolled on its side and burned, killing one occupant and injuring five others. There were eight persons aboard during the flight. TB 55-1500-311-25 states that only the test pilot and minimum crew necessary to perform the test flight will be aboard. Test flights are made to determine whether airframes, powerplants, accessories and other items of equipment are functioning as they should. Additional passengers and excess crew members do not assist in accomplishing this objective. Violation of the rules outlined in this technical bulletin

unnecessarily endangers the lives of personnel not essential to the mission.

An AH-1G pilot departed the airfield and was flying No. 2 in a formation of three. He saw a unit of armored personnel carriers. He broke formation and dove toward the carriers from approximately 1,000 feet. He could not recover from the dive and the helicopter struck the ground in a nose-high attitude on the side of a small hill. The tail boom, main rotor, transmission and engine separated. The fuselage then bounced several times and rolled end over end, coming to rest inverted. The pilot was killed, the copilot had serious injuries and the helicopter was destroyed.

The aircraft accident investigation board listed three possible contributing factors: (1) gross judgment error about the recovery altitude required for a given speed and dive angle, (2) helicopter was over gross weight, requiring increased recovery altitude and (3) improper dive entry, resulting in a temporary zero gravity condition and subsequent loss of control. The accident report stated that because of mission requirements, it may be necessary to rapidly lower the nose of the AH-1G. Every aviator flying this helicopter should be familiar with the dive characteristics and the specific warning of this type maneuver outlined in TM 55-1520-221-10.

The flight surgeon commented: "Although accidents similar to this may never be eliminated entirely, every effort should be made through the initial selection, training and education of pilots as much as possible to decrease them."

Flight rules and regulations are made for your protection. Violations are gambles. Like a hot crap shooter, you may keep the dice rolling through many passes. But when the dice cool or your luck runs out, the stick man will rake in all you've gambled—including your life!

Main fuselage of AH-1G came to rest inverted after helicopter struck hillside

CW3 Jose A. Suarez
Data Center, USABAAR

AFTER RELEASE from a DCS mission, a slick with a crew of four departed for home base. Fifteen minutes later, at 1,300 feet MSL, the crew chief saw a CH-46 lift off from an LZ below. He kept it in sight and told the pilot he had traffic at 5 o'clock low. The pilot acknowledged and told him to keep an eye on it. He did not alter the slick's course or altitude.

After stabilizing his climb attitude, the CH-46 pilot maintained his original heading, apparently

Visibility Restrictions Demand Clearing Turns and Alertness

unaware of the slick's presence. As the gap between the two helicopters narrowed, the slick's crew chief told his pilot once again about the converging traffic at 5 o'clock low. He also asked the gunner to watch it when it crossed below. Again, no evasive action was taken by the slick's pilot.

Moments later, the crew chief became concerned. He was about to lose sight of the CH-46 and asked the gunner to pick it up on his side. The gunner leaned forward as far as his seatbelt would let him and scanned the area below and to the rear. He did not see the CH-46. The midair collision was inevitable!

The UH-1 pitched up, rolled left and shook violently. The pilot fought his stiffened controls and managed to get the UH-1 to the ground and land.

Crew members of a third aircraft who saw the midair collision said the CH-46 hit the UH-1 from the right rear, then rolled right and nosed over into a dive. It burst into flames on ground impact and none of the 12 occupants aboard survived.

Investigation revealed the CH-46 crew probably did not see the UH-1 until impact due to restricted visibility. The absence of transparent panels in the upper front area of the cockpit in this type aircraft restricts pilot visibility under the following conditions:

1. When the helicopter is parked on level ground.

2. When the helicopter assumes a stabilized climb attitude (nose low).

3. During an air speed over altitude takeoff.

4. Visibility is further decreased under these conditions when the front seats are locked in their full aft position.

The stabilized climb attitude and the failure to make clearing climbing turns prevented the CH-46 crew from seeing the slick in their climb path. To prevent recurrence, transparent panels were recommended for installation to permit visibility along and above climb paths. Installation of a proximity warning device was also recommended. At the time this midair occurred, such a system was being researched at Fort Rucker. Installed in each aircraft, the proximity warning device alerts crews to nearby targets within the range of its sensors. It has tremendous potential in the training environment.

However, equipment limitations are here to stay. Crews must be trained to adjust. Obviously, cockpit visibility could be greatly improved if aircraft were designed to fit pilots in glass bowls. Even then, blind spots would exist beneath the seats. Should the aircraft descend vertically, chances are good it could strike an obstacle unless the pilot cleared his intended flight path prior to descent. Designers must consider other factors besides visibility. While the glass bowl might offer 95 percent visibility, its crashworthiness could well be in direct reverse proportion.

Because design must be influenced by other factors, pilots must adjust to visibility restrictions and plan their flying accordingly. As evidenced by this accident, climbing and descending turns are not always used to clear other traffic. Elementary? This technique could have alerted the CH-46 crew in time to take evasive action.

The flight times of the crews involved in this accident ranged from 750 to 950 hours. Most of this time was in RVN. All had adequate sleep the previous 24 hours. They had no record of previous mishaps and all had been given standardization checkrides within 90 days, had current physicals and no apparent diseases or defects were evident in their medical records. Weather was not considered a factor.

Repeated warnings by the crew chief did not get the message across to the pilot at the controls. He did not alter course or attempt any evasive maneuvers to ensure clearance. Obviously, had the UH-1 pilot reacted to the crew chief's warnings, the pilot of at least one of the helicopters involved would have seen the other helicopter in time to avoid it.

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How Do You Get The Ball Rolling?

Adapted from Third U. S. Army Pamphlet 95-2

THAT FORCE called inertia is both friend and foe. A 2,000-pound ball can be rolled easily once it leaves a static state. It's that first push that's so tough. How about your accident prevention program? Is it static? Once you get it moving, it's surprising how it will roll almost unaided. The problem here is not just pushing an inanimate object, but motivating individuals. Comparatively, that's a Herculean task.

First, let's make an assumption the average individual has heard about *safety* since he was in knee pants. When you open your mouth and say *safety*, he may not turn off, but chances are he'll tune you down a notch because he's heard it all before. Yelling a little louder only turns his volume control further down until he finally turns you off. Now what? Any accident prevention program has to begin with interest and must maintain and magnify professional interest as it progresses. In this respect, how you develop that interest is totally up to your imagination and the CO's blessing.

Perhaps you've imagined yourself into an absolute blank by this time. If so, some of the following ideas, some from USC, some from units and others from under the hold box, may work for your unit. They have worked at one time or another for other units.

How many posters are on your accident prevention bulletin board? Probably so many, and some so old, that no one reads them. Additionally, most of the ones you get do not put across what you want to say. Try this: Get a picture or large color advertisement from any magazine, that has eye-appeal, is current and will relate a message. Mount it and supply your own caption relating to the theme you want to push this week, month, etc. (Yes, even a center fold may be all right *if* it has the CO's blessing, and *if* it is pertinent. When a picture or caption distracts from the intended message or is in questionable taste, it is

ineffective as a tool in your program.) One that comes to mind is a skinny, stern, scroogy-looking Santa Claus in a December advertisement with the homemade caption, "Bah, Humbug! There's no stocking for you until you use your checklist!" To relieve yourself of some of the burden and *get others involved*—that's what it's really all about—have each unit provide a different, meaningful poster at stated intervals. The ingenuity, imagination and talent that results will astound you. Your *personnel are involved* and the ball has started to roll!

Who speaks at monthly and bimonthly meetings and classes? About what and how long? If it's the same person or people speaking about the same basic items for the same programmed 50 minutes, you might as well cancel it. After the second meeting, you'll be lucky to have 10 percent of your audience with their receivers on, to say nothing of the frequency to which those few will be tuned. Use your experts! Have the firefighters in to demonstrate their equipment and techniques. The flight surgeon is good for a great variety of topics. ATC people are great for pilots and tech reps or field maintenance personnel for mechanics. Also use your own personnel with special talents—examiners, technical inspectors, etc. Vary the topics with the theme you want to push, but always permit free discussion on any pertinent topic. There is nothing that will turn the program sour faster than 10 speakers with 10 different topics, or one speaker trying desperately to last for 50 minutes. Keep the topics few and fast and attempt to promote discussion. If there is none, realize your meeting is over and pull a fast disappearing act into the wings.

Here is an idea that can be very informative and fun. Have each platoon dig into the manuals and come up with a few questions for the meeting, requiring members of another platoon to supply the answers. Hash out the answers and arguments that develop from this friendly competition, then set the matter straight from the book. Your personnel are again involved and the ball's rolling faster!

How well do your pilots and mechanics know their aircraft? Here's one that started in Germany between two very experienced and talented CW4s. Each got an obvious and sadistic pleasure from being right and proving the other wrong. One caught the other in the hall one morning with an obscure UH-1 dash 10 question. The answer would have taken Ma Bell an hour to find in the manual and the on-the-spot reply was incorrect, costing one beer. That was an invitation to open warfare which eventually involved everyone and resulted in hours of dash 10 study to catch some poor colleague with a wrong answer. The idea spread to the maintenance hangar and the dash 20, which almost proved disastrous when the mechanics started memorizing torque values and not using their manuals during maintenance. Overall, however, this was a self-perpetuating program which resulted in some extremely well informed aviators and mechanics. They became more professional because of their ever-increasing knowledge of their flying machines. It needn't stop there. ATC procedures, firefighting and many other areas are open to pursuit. Imagine the impression of newly assigned personnel observing this professionalism in action, with all of the unit personnel involved. The ball gets another push!

How many errors occur on your flight plans or 2408-12s and -13s? One method of correcting these is to collectively agree to levy pilots and copilots 5 cents an error, or crew chiefs the same for the maintenance forms. In a very short time, this kitty could provide an outstanding unit beer party. If that seems a bit extreme, take the worst form of the week and post it with the errors circled in red. By doing this, you bring an unprofessional job to the attention of the whole world. After a short time you'll notice people brushing up on their forms and becoming more professional and involved. And the ball rolls on!

The Air Force once had a list of qualifications for a safety officer which included lover, pilot extraordinaire, comedian, fast talker, drinker of strong beverages, skilled second story man, etc. Actually, some of these qualities may be beneficial in an unofficial way, but common ordinary horsesense and a touch of imagination will stand you in good stead to provide motivation and GET PEOPLE INVOLVED!

A question is now appropriate. How many times has the word *safety* appeared in this article? The point is that the word *safety* is an abstract, indefinite word. As such, it is not necessary in the pursuit of an effective accident prevention program. Generating professional interest and motivation by deed rather than word is the key factor. With one good push your program will roll easily and continue rolling, assisted regularly by fresh bursts of imagination.

Now, lean back, feet on the desk, eyes closed and ponder these suggestions for your possible use. When the CO walks in, don't get up, but in slow, studied, articulate tones tell him you're thinking of how to get your ball rolling. If he understands that, you're on your way. Good luck!

USAASO Sez

The U. S. Army Aeronautical Services Office discusses

Filing of flight plans

Flight Plans: *Activation.* By regulation, each military aviator must FILE a flight plan prior to a departure. Procedures for filing with the Federal Aviation Administration (FAA) are contained in the planning section of FLIP. However, this section fails to inform the pilot that he must notify the Flight Service Station (FSS) of his departure time and REQUEST ACTIVATION of his flight plan (VFR, IFR or composite). Military flight operations will forward your "off time" and estimated time of arrival (ETA) to the tie-in FSS who forwards the flight plan to your destination. Civil towers are not required to forward time off and ETA to the tie-in FSS or destination airfield. An IFR clearance from a civil airfield does not necessarily mean your flight plan is activated with the FSS. While the clearance does allocate route and altitude controlled by the air route traffic control center (ARTCC), the destination airfield approach control may have no knowledge of your arrival until handoff procedure is initiated by the ARTCC. Flight Service Stations will hold flight plans on file for 1 hour after proposed departing time, at which time they will automatically be canceled even though an IFR request has been forwarded to the ARTCC unless:

- The actual departure time is received.
- A revised proposed departure is received.
- At the time of filing the Flight Service Station is informed that the proposed departure time will be met, but actual time cannot be given because of inadequate communications. ACTIVATION may be accomplished by a pilot request to the tower; however, direct radio communication with the FSS is preferred.

Stopover (operational stop) information. Arrival and departure times when operating on a cross-country flight plan are as important as flight plan activation since flight following (safety) procedures require accurate enroute times. Arrival/departure time should be given to the FSS as indicated in the preceding paragraph.

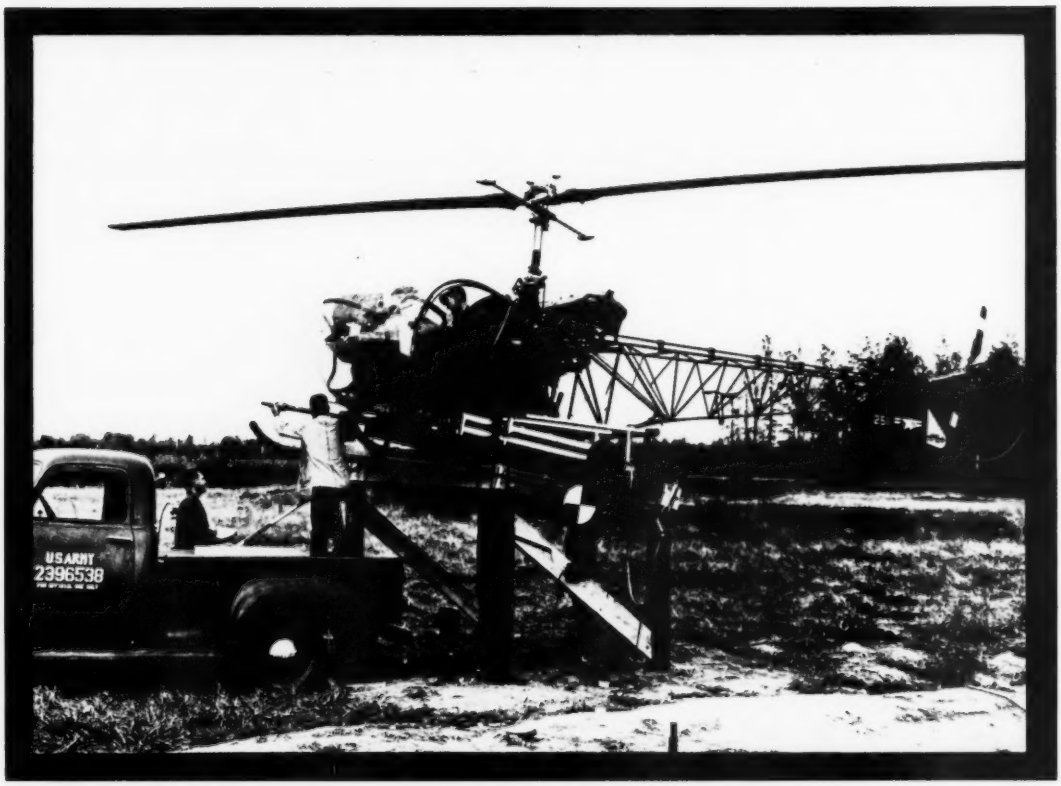
Local flights (DD-1080). Local flight plans have caused untold confusion and wasted time for FAA facilities, primarily because FAA seldom knows when the military pilot is operating on a "local." They are aware that all military flights must be on a flight plan and local type 1080 operations are not used by civilian operators. Therefore, any arrival/departure time sent to the FSS results in a communications check to determine where the aircraft came from, what the intended route of flight is, and where the destination airport might be. Confusion and uncertainty is generated because the Flight Service Station is responsible for flight following and notification procedures and to adequately fulfill this responsibility the FSS specialist must keep up with an aircraft's flight progress. Pilots on a DD-1080 are encouraged to notify the ATC facility upon landing at an intermediate field that the flight is on a local flight plan from DESTINATION airport and give an estimated time of departure. This will inform air traffic control of your type operation and relieve the FSS of flight following responsibilities for your mission.

It is impossible for the flight following system to operate effectively without the wholehearted cooperation of each airman. Keep the Flight Service Station advised of your departure and arrival times so that if and when you need help their specialists will be ready to assist as necessary. Without your help, they are helpless.

Presidential Helicopter Retired At Rucker

The helicopter that was used by former President Dwight D. Eisenhower has been retired from a long and distinguished career. It now rests at the U. S. Army Aviation Museum at Ft. Rucker, Ala. Of the three Choctaws in the Presidential flight, number 64320 flew 51 missions out of a total of 101 Presidential flights. It was the favorite of senior Army Presidential helicopter pilot Lieutenant Colonel William M. Howell (Ret.), who is now the curator of the museum. The Presidential helicopter accompanied President Eisenhower on his world tour in 1959 and most recently served General Omar Bradley (Ret.) at Ft. Ord, Calif. The CH-34 is on display at the museum which is open to the public from 0900 to 1600 hours weekdays and from 1300 to 1700 hours weekends and holidays.

President Dwight D. Eisenhower arrives at Camp David, Md., after a flight from the White House aboard his Presidential CH-34 helicopter which was flown by then Major William M. Howell (above). The President is accompanied by Naval aide Captain E. P. Aurand (today a vice admiral)



Army aviation celebrates its 29th birthday on 6 June as an integral part of the Army's combat forces. One of the chief reasons for this is the armed helicopter. Beginning in this issue, the DIGEST will be running a series covering the history of helicopter armament. In the above photo rockets are loaded to be fired from an OH-13 in the initial test of a helicopter armament system at what is now Matteson Range, Ft. Rucker, Ala.

(see story beginning on page 2)